

2014

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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**STEPPING UP FROM GREEN REVOLUTION
TO BLUE ECONOMY**

**A new paradigm for poverty eradication and sustainable
development in South Asia**

By

IMALI MANIKARACHCHI

Sri Lanka

A dissertation submitted to the World Maritime University in partial
Fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

IN

MARITIME AFFAIRS

(MARINE ENVIRONMENT AND OCEAN MANAGEMENT)

2014

DECLARATION

I certify that all the materials in this dissertation that is my not own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the university

Signature: 

Date: 22. 09.2014

Supervised by: Professor Lawrence Hildebrand
World Maritime University

Assessor: Professor Lisa Froholdt
World Maritime University

Co-assessor: Dr. Awni Behnam
International Ocean Institute

Acknowledgement

Foremost, I would like to convey my sincere gratitude to Prof. Ranjith Senaratne, Chairman of Ocean University of Sri Lanka, for nominating me as an applicant for the World Maritime University (WMU) and Prof. Morley De Silva, former Academic Head, for encouraging me to apply for WMU studentship.

I express my gratefulness to Dr. Yohei Sasakawa, the chairman of the Nippon Foundation and the Ocean Policy Research Foundation, for supporting my studies at the WMU. This once-in-a-lifetime experience, I have gathered during my stay in Sweden, is all thankful to your generous sponsorship.

My special appreciation goes to my Supervisor, Prof. Lawrence Hildebrand, for the continues support I got throughout this work. His guidance helped me develop a proposal with timely objectives and his interest on the topic made me go through many references to supplement the theories, thus making a final product with a significant weight of data and information.

I want to acknowledge the WMU library staff including Mr. Chris Hoebeke and Ms. Anna Volkova for their support in purchasing and reserving literature material. Also, I want to thank all the authors, who have published their work online and made it available as open source. Thank you for sharing your valuable work and trying to make the world a better place.

Finally, I would like to thank my parents, for their eternal love. Thank you for your understanding when I was busy with my work and not talking to you. I can't wait until I come home and tell you about my adventures in Sweden.

Abstract

Title of Dissertation: **Stepping up from Green Revolution to Blue Economy**

A new paradigm for poverty eradication and sustainable development in South Asia

Degree: **MSc**

The aim of this study is to influence the South Asian society to understand the value of their blue capital, and explain the mechanisms of its sustainable utilization to eradicate poverty and obtain sustainable development. Poverty and environmental degradation are critical issues in South Asia, and national policies to eradicate poverty, basically target agriculture development. South Asian countries are practicing intensive agriculture methodologies, introduced by the Green Revolution during the 1960s. Economical, environmental and social impacts of the South Asian Green Revolution have been discussed here, and emphasized the fact that, increased food production and economic development itself, is not sufficient enough for nations to overcome poverty.

The Blue Economy concept, which is a systematic way of utilizing ocean resources, is quite new to South Asia, even though a number of ocean based industries are currently practiced. The Blue Economy opportunities in the region have been assessed, and the necessity of incorporating them into pro-poor growth strategies has been highlighted. Importantly, it has been elaborated, how the Blue Economy concept may fit into the sustainability framework, while balancing its economic, social and environmental pillars.

The Blue Economy may face challenges in the forms of resource overexploitation, pollution, habitat degradation and climate change, and prevailing measures to address them, have been discussed. Finally, the methods to incorporate low Carbon and innovative technologies, resource efficiency, environmental

conservation and social inclusiveness, with the Blue Economy concept, have been suggested.

The study concludes that South Asia has potentiality to implement Blue Economy, but it requires strong political commitments, plenty of research and societal awareness and attitude to optimize their dependency, to achieve long-term prosperity.

Key Words: Blue Economy, Green Revolution, Green Economy, Sustainability

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List of Abbreviations

AHTEG	Ad Hoc Technical Expert Group
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BOBLME	Bay of Bengal Large Marine Ecosystem
BWM	Ballast Water Management Convention
CBD	Convention on Biological Diversity
CLC	Civil Liability Convention
CLCS	Commission on the Limits of the Continental Shelf
CMS	Convention on Migratory Species
CSR	Cooperate Social Responsibilities
CZM	Coastal Zone Management
CZMC	Coastal Zone Management Center
DFID	Department for International Development
EBM	Ecosystem Based Management
EEZ	Exclusive Economic Zone
EIA	Energy Information Administration
EIA	Environmental Impact Assessment
EU	European Union
FAO	Food and Agriculture Organization
FAO CCRF	FAO Code Of Conduct for Responsible Fisheries
GDP	Gross Domestic Production
GHG	Green House Gasses
GIS	Geographic Information System
HDI	Human Development Index
HNS	Hazardous and Noxious Substances by Sea Convention
HYV	High Yielding Varieties
ICZM	Integrated Coastal Zone Management
IFAD	International Fund for Agriculture Development
IFPRI	International Food Policy Research Institute
IHDI	Inequality-adjusted Human Development Index
ILO	International Labor Organization
IMO	International Maritime Organization
IOTC	Indian Ocean Tuna Commission
IUCN	International Union for Conservation of Nature
IWCO	Independent World Commission on the Oceans
JPoI	Johannesburg Plan of Implementation
KP	Kyoto Protocol
LME	Large Marine Ecosystems
LNG	Liquefied Natural Gas
LSCI	Liner Shipping Connectivity Index

LTTE	Liberation Tigers of Tamil Eelam
MAP	Mexican Agriculture Program
MARPOL	Convention for the Prevention of Pollution From Ships
MCPA	Marine and Coastal Protected Areas
MDG	Millennium Development Goals
MEA	Millennium Ecosystem Assessment
MPA	Marine Protected Areas
MSP	Marine Spatial Planning
OECD	Organization for Economic Cooperation and Development
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-operation
PA	Protected Areas
PPP	Purchasing Power Parity
R&D	Research and Development
SAARC	South Asian Association for Regional Cooperation
SACEP	South Asian Cooperative Environment Program
SACRTF	South Asia Coral Reef Task Force
SADC	Southern African Development Community
SAP	Strategic Action Plan
SASAP	South Asian Seas Action Plan
SIDS	Small Island Developing States
SLTDA	Sri Lanka Tourism Development Authority
TDA	Transboundary Diagnostic Analysis
TEV	Total Economic Value
UN	United Nations
UN FS	UN Fish Stocks Agreement
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Seas
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO IOC	UNESCO Intergovernmental Oceanographic Commission
UNFCCC	UN Framework Convention on Climate Change
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development
WCMC	World Conservation Monitoring Center
WH	WH World Heritage Convention
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization

Introduction

I) Background

South Asia provides home to 1.5 billion people and considered as one of the poorest regions in the world (The chronic poverty report, 2005). Most of the rural people suffer from hunger and poverty, while other socio-economic concerns and environmental degradation hinder their performances toward development. Similar to other developing regions, South Asia's rural development strategies are based on agriculture, in which the rural poor gain food and income. From the 1960s, South Asia is practicing Green Revolution strategies, which facilitate intensive agriculture, with genetically modified seed varieties, fertilizers, pesticides and advanced technologies that enhanced the regional food production. However, the amount of the South Asian arable lands is limited and Green Revolution practices have been criticized due to its negative environmental impacts and inequitable social welfare. Therefore, the expected humungous future population, needs alternative methods of food production, income generation, and social inclusiveness, which it doesn't compromise the environmental wellbeing.

70% of the earth's surface is covered by the oceans where it encloses numerous commercially important resources and intangible ecosystem services. The importance of the ocean resources for national development strategies and the necessity to conserve them, have been surfaced as the "Blue Economy concept", first proposed by the Pacific Small Island Developing States during the Rio+20 preparatory process, and the concept is gaining world attention, since it is recommended to be practiced by any state with maritime interests. The Blue Economy is considered as the Green Economy in the Ocean Environment, which requires the sustainable utilization of marine resources through the adaptation of low Carbon and resource efficient technologies, while conserving biodiversity and assuring social inclusiveness to obtain socio-economic development of the nations.

In this study, various aspects of the paradigm shift from the Green Revolution to Blue Economy have been analyzed in the context of the South Asian region. The first three chapters are devoted to analyze the current socio-economic status of the region, and the impacts of practicing intensive agriculture as the main development strategy. Fourth chapter introduces the concept of the Blue Economy, and its opportunities while fifth chapter elaborates how Blue Economy fits on the three pillars of sustainability. Sixth chapter addresses the challenges for the Blue Economy and prevailing measures to ensure good ocean governance in the region. The final chapter describes how the Blue Economy may compliment the expectations of the Green Economy with conclusions and recommendations to further promote the paradigm in the region.

I) Objectives

The study was focused at following objectives.

- Evaluate the Green Revolution strategies in the South Asian region, as a paradigm to eradicate poverty and hunger, and its impacts on socioeconomic and environmental sustainability.
- Introduce the Blue Economy concept to the South Asian Region as an alternative paradigm for development and understand the capacity of the potential opportunities.
- Reveal the methodologies to make the Blue Economy concept compliment the development goals.
- Evaluate the possible challenges for the Blue Economy and introduce the greening techniques to achieve economic, social and environmental sustainability.

II) Methodology

The quantitative and qualitative data have been collected from international data bases, peer reviewed journals, subject related books and online publications. Data comparisons have been done using the MS Excel where necessary, and all the diagrams and tables have been synthesized by the author, based on the revealed facts, unless otherwise cited. Data have been graphically illustrated to show the trends of intensive agriculture. Since Blue Economy is not yet systematically practiced as a development strategy in the South Asian region, sector-wise raw data are rare for quantitative analysis. In that case, conclusions are made, based on the previous studies. Applications of the two paradigms are qualitatively compared and emphasized the fact that unsustainable Blue Economy will lead to the same negative impacts that the Green Revolution resulted. Based on the published information, the concept has been placed within the sustainability framework, where it has addressed how the three pillars can be balanced.

III) Outcome

This study is an attempt to further elaborate the Blue Economy concept, within the sustainability framework and it describes how the South Asian Region can improve their performances to obtain optimum benefits from the ocean resources, to eradicate poverty and achieve economical, social and environmental wellbeing.

Chapter 1: South Asia poverty status and development strategies

1.1) Socio economic outlook of South Asia

The South Asian region holds a special social, economical and political importance as one of the most populated areas in the world. The region consists of several major countries bounded by the Indian Ocean; from the south, namely, Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka and Maldives, where the combined population is around 1.5 billion, which is more than one fifth of the world's population. Despite the fact that South Asia is the poorest region after Sub Saharan Africa, it consists of a vast array of natural resources and rich biological diversity.

Even though, there is no precise definition for the term “socio-economic status” (Kahl & Davis, 1955), it generally indicates the income level, wealth, accessible resources and many factors related to one's social power. In order to obtain a clear idea about the social and economical conditions of the countries and the region as a whole, several indicators can be used and compared. In this chapter, some commonly used indices, which express the national and regional socio-economic status, have been compared to show each country's performance and that of the South Asian region in the global context.

1.1.1) Gross Domestic Production per capita (GDP per capita)

GDP per capita, calculated as the ratio between a country's GDP and its midyear population, is a commonly used indicator of economic performance and average living standards (OECD, 2010). According to 2014 World Bank statistics, the South Asian region claims the lowest GDP per capita value, which is only higher than that of the African region. In 2012, it was 1663 USD, which is 83% lower than the average global GDP per capita (Figure 1).

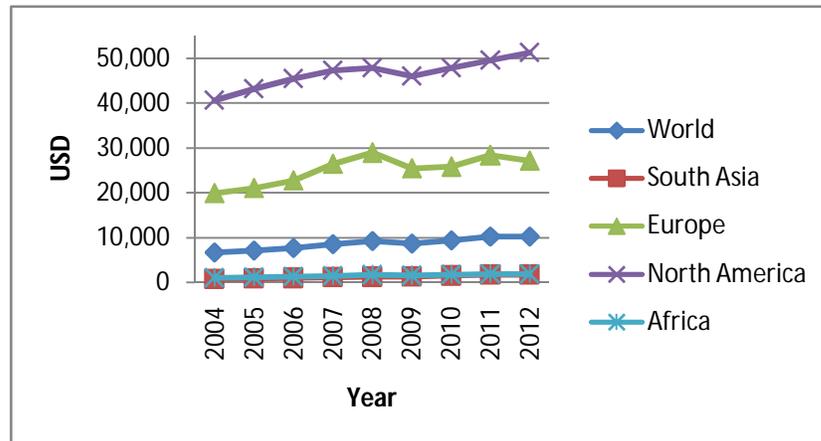


Figure 1. Global and regional GDP per capita (UN, 2013)

Apart from the fact that South Asia's economic status is below the global average, the region is transitioning from low-income to middle-income level (Ghani, 2011). But still, South Asia is home to a large population of poor people, therefore progress on poverty reduction is limited. For example, India, which has almost a similar population to China, is not performing as well as China does in poverty reduction, due to slower growth of income and its inequitable distribution across the population (Ghani, 2011).

In terms of GDP per capita, Maldives and Sri Lanka are the best performers in the region (Figure 2). Maldives, which is a major tourism nation in the region, introduced strategic changes to its tourism industry in 2012, to keep its share of the national GDP stable, which earned them the highest GDP per capita in the region (Ministry of Tourism, 2013). For Sri Lanka, the growth is due to the increment of private sector investments after the end of the 30-years of civil war in 2009 (The World Bank, 2014). Even though India is usually among the top 10 largest economies in the world, its GDP per capita level is far too low due to the high population.

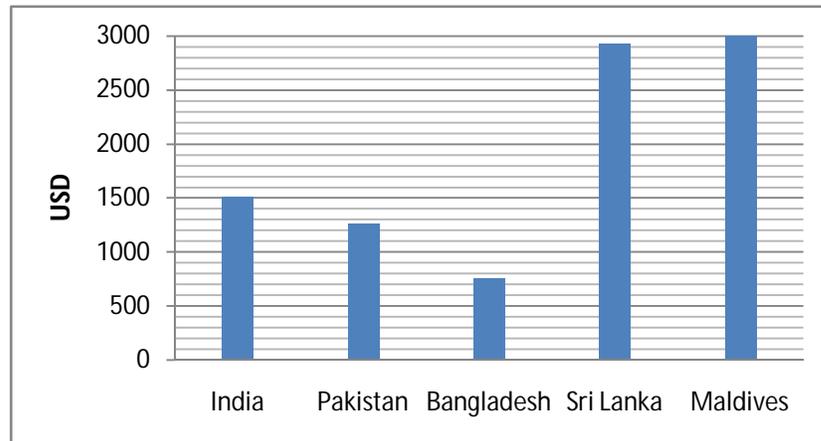


Figure 2. National GDP per capita, 2012
(The World Bank, 2014)

1.1.2) Inequality-adjusted Human Development Index (IHDI)

In order to include the activities that are not monetized, for example choices of long life, comfortable living standards, ability to breath clean air, ability to be free etc., the “Human Development Index”, was introduced under the sponsorship of UNDP in 1989 (Ul Haq, 2003). HDI is calculated as a numerical index of health, education and income, but it neglects inequalities of the three aspects across the whole population (Alkire & Foster, 2010). Therefore, Inequality adjusted Human Development Index (IHDI) was introduced in 2010.

The average IHDI score of South Asia is below the world average (Figure 4). In 2012, the IHDI score of the South Asian region was 0.395, which is slightly higher than that of Sub Saharan Africa. In 2012, Maldives claimed the highest IHDI score of 0.688, while Pakistan claimed the lowest IHDI score of 0.356 (Figure 3).

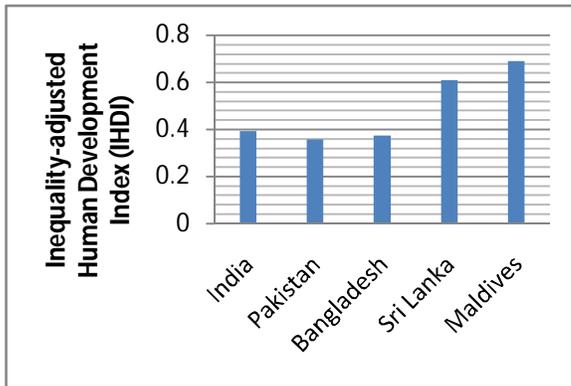


Figure 3. IHDI of 2012 (UNDP, 2013)

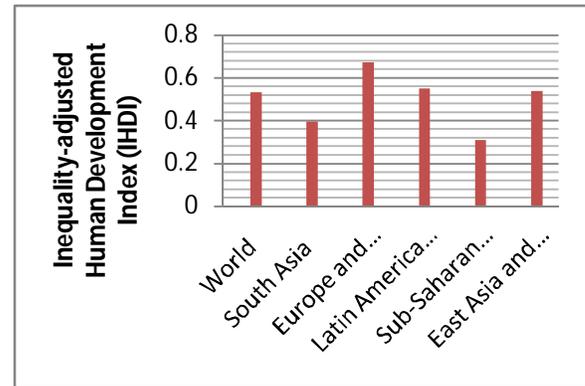


Figure 4. Global and Regional IHDI (2012), (UNDP, 2013)

1.1.3) Poverty headcount ratio at \$1.25 a day (PPP)

Poverty head count ratio, which is one of the commonest method of poverty measurements (Subramanian, 2005), calculates the % proportion of the poor people out of the total population. In 2010, it was reported that 31% South Asians lived on under \$1.25 a day (Figure 5). This is only higher than Sub Saharan Africa, where 48.5% of the total population lived under the poverty line. Worst condition remained in Bangladesh while Sri Lanka had the lowest proportion of the poor (Figure 6).

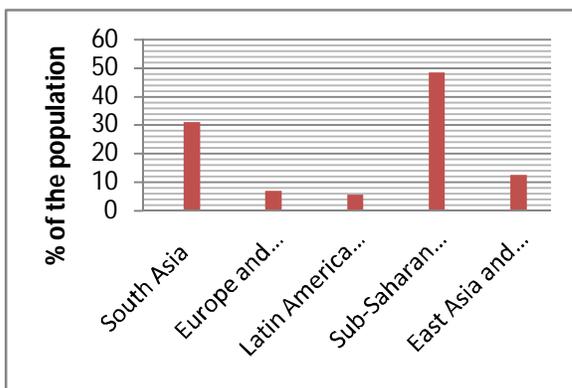


Figure 5. Regional poverty head count ratio at \$1.25 a day (2010) (The World Bank, 2014)

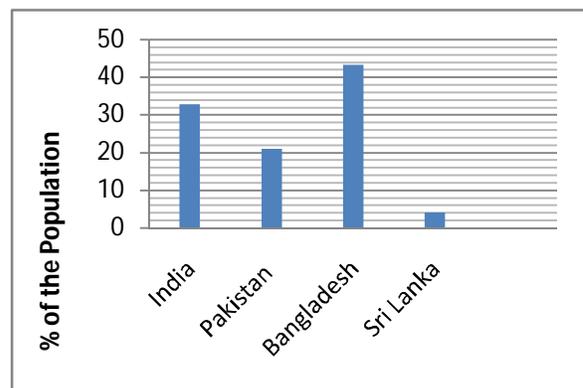


Figure 6. Poverty head count ratio at \$1.25 a day (2010) (The World Bank, 2014)

1.1.4) Global Hunger Index (GHI)

The Global hunger index, which consists of three combined indicators of undernourishment, child under weight and child mortality, is a comprehensive tool to measure global and regional hunger levels (Global Hunger Index, 2013). In 2013, the worst regional situation was recorded in South Asia, where the GHI score is 20.7 (Figure 7). The GHI score of all the countries in South Asia (Figure 8) are above “serious” level (score 10-19.9) and India falls under “alarming” level, where the score lies within 20.0 - 29.9 (Global Hunger Index, 2013).

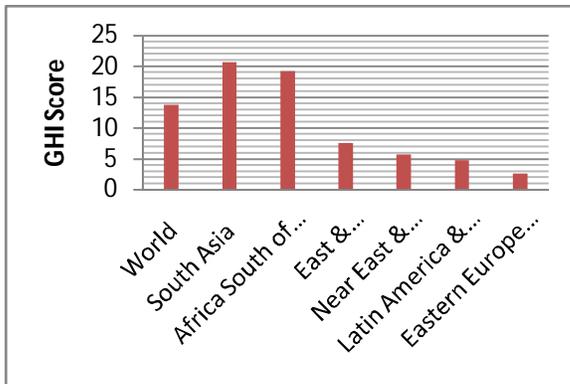


Figure 8. Regional GHI scores 2013 (IFPRI, 2013)

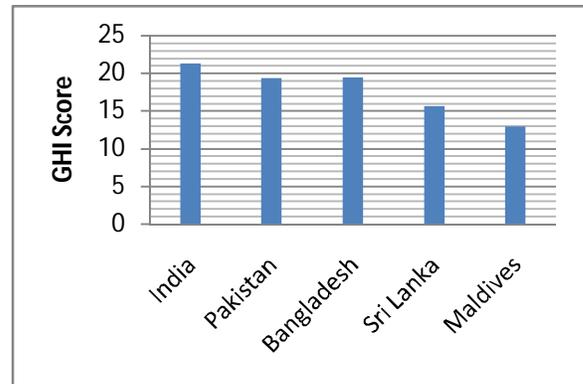


Figure 7. GHI scores 2013 (IFPRI, 2013)

1.2) Causes of poverty in South Asia

Among the scholarly articles on the poverty and social policy research, the definition of “poverty” lies on one of the following categories (Hagenaars & de Vos, 1988).

- a) Having less than objectively defined or absolute minimum.
- b) Having less than others in society
- c) Feeling of having not enough to get along.

Within these categories, there can be many possible definitions for poverty. They may rely on income, consumption and human welfare to indicate one's economical and social wellbeing. On these aspects, the above statistics provide evidences that South Asia is home to a larger proportion of the world's poor, who suffer from poverty, hunger, under-nutrition and low living standards. Thirty three percentage (33%) of the poor in South Asia are in chronic poverty, which they suffer for most of or throughout their lives, pass to their children and die of easily preventable deaths (The chronic poverty report, 2005). The majority of them are from India and a considerable amount is from Bangladesh and Pakistan. Despite the fact that most South Asian countries have shown impressive images of % GDP growth for past few years (Devarajan & Nabi, 2006), the total number of poor people in the region has been increased through the time (Ghani, VOX, 2010). Therefore, the share of South Asia for the world's poor is still huge and poverty reduction remains a challenge.

Poverty is caused by number of facts in a country. Colonial history, slow economic growth, inequality, discrimination, war and political instability, national debt, geographical disadvantages, corruption, natural disasters and environmental degradation are few of the many acute causes of poverty, which may interact to create prevailing ill socioeconomic conditions of many developing nations.

1.2.1) Social inequalities

A country's economic growth will not be necessarily transformed in to poverty reduction, if the social inequalities are huge (Adams, 2004). This explains the incompatibility of current South Asian GDP growth rates with their poverty reduction statistics. The reason is that they have experienced economic growth as well as increment in inequality for the past few years, which is why it hasn't resulted in considerable poverty reduction (Ghani, 2011). Inequality is traditionally subjected to distribution of resources, utility, welfare and often income status (Melamed & Samman, 2013). In many large developing countries, there are huge

regional differences, that if some areas are separated from the whole country, the rest of the country might be qualified to a “developed” state (Cole, 1981). Based on the 55th National Sample Survey of India, the poverty reduction is limited in states with large poor population and more obvious in states with low poverty head count ratio, hence indicating a wide disparity among states (Poverty profile: India, 2006). In Sri Lanka, the western province contributes more than 50% of the national GDP and the wages are twice as higher as the other regions (“Sri Lanka: Reshaping Economic Geography”, 2004)

1.2.2) Political instability

Political stability is one of the factors, which makes a country more suitable for domestic and foreign investments in both physical and human capital (Soubotina & Sheram, 2000). Unstable political status of a country may result in political upheaval, sudden changes of tax regimes and government collapses, which might scare away the potential investment opportunities and people wouldn't be able to benefit from them. In South Asian countries, there are some identified challenges to political stability. In India, insurgencies, coalition government and ethnic violence cause the political instability while in Sri Lanka, the civil war has much to do with the lost opportunities in terms of the economic performance (Sridharan, 2014).

1.2.3) Geographical disadvantages, Natural disasters and climate change

Statistical evidences prove that there are significant correlations between spatial factors and poverty (Burke & Jayne, 2010). Many of the South Asian countries are situated in strategic geographical positions, surrounded by the Arabian Sea, the Indian Ocean and the Bay of Bengal. However, geographical locations in some South Asian countries provide them with both advantages and disadvantages. Taking India as an example, the country is blessed with the most luxurious landscapes of all the Eurasia, yet it is dangerously close to the Central Asian

steppe and the Persian-Afghan plateau, making it vulnerable for invasions which threaten the political stability (Kaplan, 2010). All the South Asian countries excluding Nepal, Bhutan and Afghanistan, claim maritime borders. The development levels of land-locked countries are often lower than that of their maritime neighbors, though the contribution of landlockedness to overall development is unclear (Faye, McArthur, Sachs, & Snow, 2004). Nepal and Afghanistan have the lowest IHDI of all South Asia, which may provide evidence to this argument (United Nations Development Program, 2013).

South Asia is often prone to severe natural disasters. Heating and cooling of the giant Indian subcontinent results in seasonal monsoons, which nowadays the patterns are altered by climate change. This may end up with flooding or cyclones, perishing thousands of human lives. The potential impacts can be huge due to the high population density. In developing countries, the vulnerability for natural disasters can be significant due to high frequency of occurrence and lack of preventive measures (Freeman, Keen, & Mani, 2003), while the damages as % of GDP and number of deaths is quite high (Henderson, 2004). The Low-lying Bangladesh is often caught up with severe natural disasters, killing people and destroying properties. Four thousand (4000) people were killed by two floods and a cyclone in 2007 and the economic losses were estimated as 3 billion USD (Memon, 2012). The 2004 Indian Ocean Tsunami is one of the major recent mega disasters, causing massive damage to coastal regions of India, Sri Lanka and Maldives. The recent economic growth in the region has demanded more energy consumption of the large population, exceeding 2.5 billion tons emissions of CO₂ equivalents, which is a 3.3% increment since 1990 (Memon, 2012). Along with global warming, the region is at risk of the fast melting of the Himalayans which may adversely impact on the sustainability of the water resources, representing 8.3% of the global water resources, but quenching the thirst of 21% of the world population (Memon, 2012).

1.2.4) Discrimination

The human capital of the South Asian region claims asymmetric rights and opportunities as they are discriminated into majority and minority, based on caste, religion, ethnicity, class and gender (Mohsin, Sivaraman, Shaik, & Kodikara, 2010). Cast-based discrimination, which ineffectively allocates human resources, hence distorts the labor market, is considered as a violation of human rights and a major challenge to the efficiency of the economy (Cast-based discrimination in South Asia, 2009). In South Asia, these out-casted people are called as “Dalits”, representing 15% of the world’s poor and have limited access to education, resources, land, credits and decent work (Cast-based discrimination in South Asia, 2009). Discrimination against women is another significant factor. In the real world, though the number of females is supposed to be higher than the number of males; in some Indian states, this ratio is less than 900 females to 1000 males, which some authors call as the “missing women” (Mehrotra & Kapoor, 2009). South Asian women are discriminated by low wages, unpaid work, limited access to resources, poor working conditions and sexual harassments (Ghatak, 2004).

1.3) Poverty reduction strategies

Poverty is described as a combination of lack of power and money (OECD, 2014) and poverty reduction has always been a critical topic for international and regional level discussions. Economic growth is the key principle of poverty reduction (Besley & Burgess, 2003). Based on that, several agendas have been developed to alleviate global poverty for past few decades, including the Millennium Development Goals.

1.3.1) Millennium Development Goals (MDG)

Recent global poverty eradication strategies deviate from the economic growth as the main development goal, and more focus on the survival of the poor, and development of social welfare, such as health and education (Lopes, 2012). Mostly

discussed strategy is the MDG, an overarching framework to cut poverty in half by 2015 (Maxwell, 2005). The MDG is a set of goals to address the issues of extreme poverty within a certain time frame, adopted by 147 countries in the year 2000, United Nations Millennium Summit. The target is to achieve eight goals to reduce global poverty. The targets, as in the global development agenda, include poverty eradication, combating hunger, improved education, environmental health and empowering women (UNDP, 2010).

Eight goals:

- 1) Eradicate extreme poverty and hunger
- 2) Achieve universal primary education
- 3) Promote gender equality and empower women
- 4) Reduce child mortality
- 5) Improve maternal health
- 6) Combat HIV/AIDS, malaria and other diseases
- 7) Ensure environmental sustainability
- 8) Develop a global partnership for development

1.3.1.i) *South Asia's progress towards MDG*

With less than one year remaining to achieve the MDGs, the overall South Asian Region has achieved remarkable progress, but still lags behind the targets of alleviating hunger, poverty eradication and environmental health. It is unlikely that the region will meet the goal of combating hunger by 2015, and the health of the environment gets threatened by loss of forests, reduced biodiversity, species extinction and renewable water resources being scarce (UN, 2014). According to the 2014 UN Millennium Development Goals report, South Asia lags behind in poverty eradication, combating hunger and environmental sustainability. The percentage of the people living under the \$1.25 a day should be 25.5% in 2015 but still it is 30%. India and Bangladesh are among the few countries with largest

shares of the global poor with 32.9% and 5.3% respectively. The highest percentage of vulnerable workers in South Asia with unpaid family work, include 80% of women. The share of undernourished people is 17%, which has to be reduced up to 13% by 2015 and the share of undernourished children under age 5 is 30%, which has to be reduced up to 25%. The amount of renewable water resources is approaching scarcity for people's lives and environment, with 48% withdrawal rate. These statistics reveal that the existing poverty eradication methodologies are quite insufficient and more practical solutions are immediately in demand.

Chapter 2: Agriculture for poverty eradication in South Asia

2.1) Role of agriculture in achieving MDG

Overall GDP growth in the agricultural sector is twice as effective in poverty reduction as that of the growth in non-agricultural sectors (World Bank, 2008). High development in agriculture has caused substantial poverty reduction for a number of countries, such as India and china. Recent economic development in East Asia is basically due to the increased agricultural productivity, resulting from market liberalization and technological growth (IFPRI, 2007). The influences of agriculture can be direct or indirect, such as direct influences being income generation, and indirect influences being increased food supply for cheaper price and employment generation. These direct and indirect impacts of agriculture growth have more powerful effect on poverty reduction than the effects of growth of non agricultural sectors (Bresciani & Valdés, 2007).

Even though, the first goal of the MDG is directly related to eradication of poverty and hunger, most of other goals are directly or indirectly linked with it. Raised

income, better quality food and employment opportunities shall provide answers for many of the prevailing issues in developing countries. Other than poverty eradication, agriculture development contributes to increase income opportunities of women, reduce child and maternal mortality by producing nutritious and diversified food, combat against diseases by providing nutritious diets and making additional income for medical treatments and develop global partnership through the assistance for agriculture development, with both positive and negative influences on primary education and environmental degradation (Rosegrant, et al., 2006). However, the influence of agricultural development may have different poverty reduction values from region to region. Sub Saharan Africa and South Asia may get benefits for poverty reduction from growth in agriculture while industrial growth and services growth may be more effective in poverty reduction in East Asia and Latin America respectively (Hasan & Quibria, 2004).

2.2) Role of agriculture in South Asia

Agriculture has a long history of being a major occupation of the South Asian people. More than half of the South Asian population lives in rural areas and they are predominantly depend on agriculture (Figure 9).

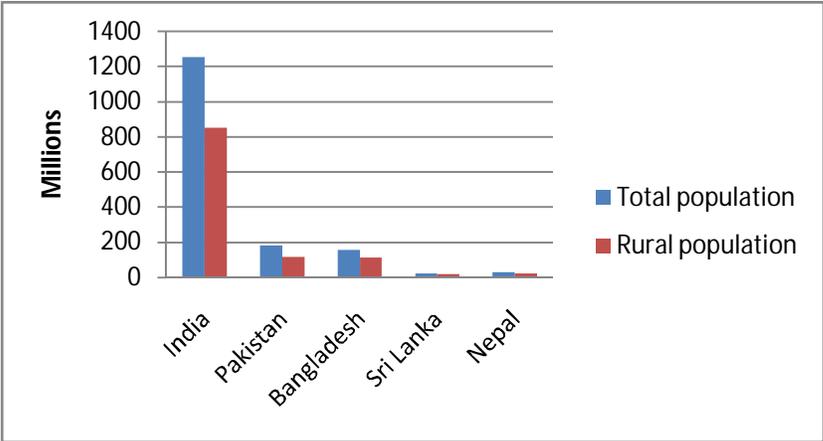


Figure 9. Total and rural populations of the South Asian countries (The World Bank, 2013)

Even though the agricultural sector plays a major role in the South Asian economy, in most countries, the significance of agricultural growth rate in terms of GDP share and labor force, is slightly declining, due to income diversification followed by the industrial revolution (FAO, 2006). However, the absolute number of agricultural workforce is still increasing. Figure 10, 11 and 12, illustrate the importance of the agriculture sector to the South Asian Economy.

A large proportion of the South Asian poor population is living in the rural areas. The number of poor people in rural areas that live on less than \$1.25 a day is 503 million in South Asia, which is the highest number of rural poor population in the world, and this number will be at its peak during 2020-2025, with a very slow rate of declining (IFAD, 2010). The conditions get worse with the increasing population and resource scarcity. Therefore, empowering the opportunities of rural people shall be the most realistic approach to eradicate rural poverty. A study has proved that the benefits of the economic growth for poverty reduction have a high influence on the poor people, if the growth occurs in the same geographical location as the people live in (Christiaensen & Demery, 2007).

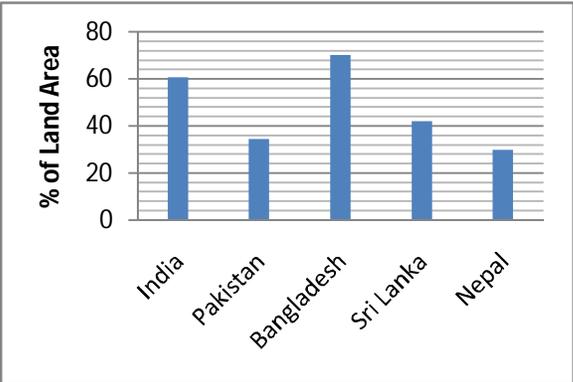


Figure 10. Agricultural land as % of total land area

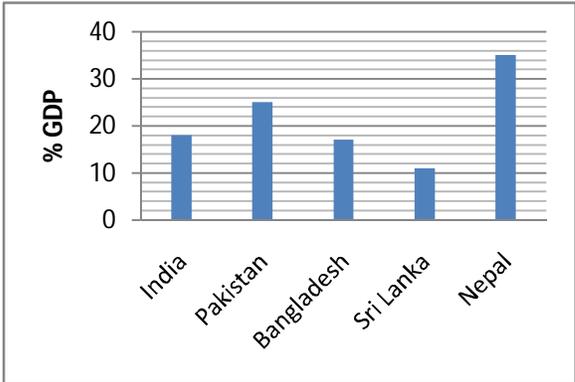


Figure 11. Agriculture share as % GDP

Source: (The World Bank, 2013)

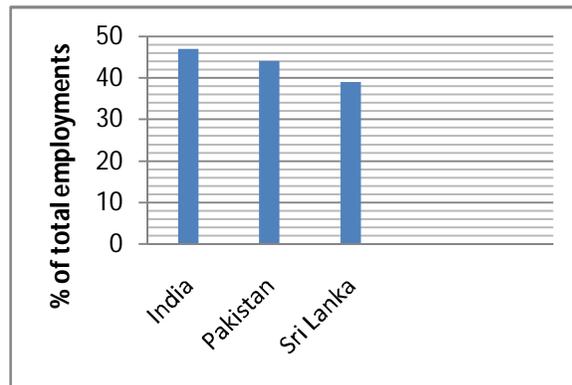


Figure 12. Agricultural employments as % of total employments

Source: (The World Bank, 2013)

2.3) Agriculture expansion of the South Asian region

The importance of an agricultural-led growth strategy for the South Asian region has been discussed in the areas of agricultural expansion for improved productivity, advanced irrigation systems, enhanced agricultural exports, development of rural infrastructure and rural industrialization (Bajpai, Sachs, & Volavka, 2004).

Poverty has to be attacked in a way that the strategies promote opportunities, facilitate empowerment, and enhance security of the people (The World Bank, 2001). Agricultural development, policies for secured ownership for land and water supplies, inventive technologies, access to market and microfinance and opportunities in resource management, make it ideal for both economic growth and poverty reduction, which is known as “pro-poor growth”, that is more typically needed in Asia (Thapa, 2004). Some studies have demonstrated how agricultural development may benefit poor people. In India, it has been concluded that both rural and urban poor may benefit from growth in agriculture, while none is impacted by the growth in manufacturing (Gaurav & Ravallion, 1996). A study

done in Bangladesh suggests that pro-rural development policies may bring down the poverty headcount by 3 points (Wodon, 1999). Poverty in the South Asian region cannot be eradicated by agricultural development alone, but it is an essential component which develops the rural infrastructure, creates jobs and increases people's nutrition levels.

Based on the fact that agricultural development plays a significant role in poverty reduction of rural poor, international and bilateral donors such as the World Bank, The Asian Development Bank and the International Fund for Agricultural Development (IFAD) have adopted many assistance programs for the region. For example, the strategy adopted by the IFAD, included enhancing the access to productive resources, introduction of sustainable agriculture technologies, promoting better governance of the poor, widening the availability of financial resources, income diversification by non-farm employments and improved market access, where it is focused on less favored areas and socially marginalized people (Thapa, 2004). But nothing overtakes the introduction of the "Green Revolution", which enhanced the crop productivity by introducing modified varieties, intensive usage of chemicals and improved irrigation technologies, to feed and develop the living status of millions of poor.

2.4) Green Revolution

2.4.1) History

Facing large population increases and subsequent reduction of food supplies, an innovative strategy was in demand to feed millions of people in the world, and to stop a third world war, in which people would fight for food and arable land. The term "Green revolution" was introduced to the world by Norman Borlaug, an American Biologist, who believed that the solution should be the increment of the yield per land unit. The "miracle seeds" plowed by the Green Revolution, turned a new page in the history of combating global hunger.

The Green Revolution was first introduced in Mexico in the 1940's, when the US Vice President noted that the people in Mexico are suffering from lack of food. He met with Raymond Fosdic, the president of the Rockefeller Foundation, which is a private humanitarian foundation and expressed his vision that those peoples' subsistence has to be expanded (Kohler, 1943). This discussion was further influenced by the request for the foundation, made by the Mexican Government, to assist in the enhancement of the country's agricultural productivity. As a response, the Mexican government established the Mexican Agricultural Program (MAP), in collaboration with the Rockefeller Foundation, with the goals of developing the Mexican agricultural sector, above the subsistence level with use of innovative technologies.

The program, which was led by J. George Harrar, including several other fellow agricultural scientists, including Dr. Norman Borlaug, was commenced outside of the Mexico City in 1943. The team worked on a three-part strategy to "improve the yields of the basic food crops" in Mexico, in which the three strategies included introduction of High Yielding Varieties (HYV) of crops, making use of advanced agricultural technologies, and training of local agronomists and agriculture professionals (Kohler, 1943).

At that time, the conditions for agricultural practices in Mexico were unfavorable and wheat crops were suffering from "wheat rust", a deadly fungal disease, for which Borlaug was trying to develop a rust resistive variety of wheat (Ganzel, 2007). He cross-bred different varieties of wheat and rice to create new forms that are capable of withstanding the disease. With the accomplishment of that goal, Borlaug concentrated his works on enhancing the yield of wheat per acre. He introduced high yield dwarf wheat, which was a cross-bred of Mexican and Japanese dwarf varieties that was resistive for diseases. These strategies made Mexico capable of producing their own wheat from 1956 to 1971 (Ganzel, 2007).

The growing population's food demand was extensive and Mexico was running out of new land for wheat cultivation. This situation outreached the sufficient levels of local wheat production and Mexico had to start importing wheat again. The team continued to introduce more and more disease resistant new HYV and this was supplemented by usage of fertilizers, pesticides and irrigation of the crop fields. These HYV grew well with the presence of adequate irrigation, pesticides, and fertilizers, compared to the traditional varieties (Hicks, 2011).

The "miracle seeds" of Norman Borlaug made him the winner of the 1970 Nobel peace prize and they were considered as new sources of abundance and peace (Shiva, 1991). The results of the Green Revolution technologies were very impressive, that the other third-world nations in Latin America, Africa and South Asia also expressed their willingness to adopt Green Revolution strategies to their own lands to feed the growing population. With the aid of the US government and the Rockefeller Foundation, many poor countries in the world were convinced that they are ready to face the predicted future famine.

2.4.2) Achievements of the South Asian Green Revolution

Introduction of the Green Revolution is not the beginning of the agricultural efforts to obtain an increased yield-per-acre in many South Asian countries. In India and Pakistan, increased food grain production was recorded during the 1950's to 1960's, due to expansion of agricultural land, while Bangladesh and Sri Lanka have increased yields, recorded during the "pre Green Revolution" period (Farmer, 1981). However, the introduction of dwarf varieties of wheat and rice after late 1960's, certainly increased the yields. Spectacular results could be seen in wheat production, where a 9.9 million tons yield in 1964 increased up to 26.4 million tons in 1971 in India (Farmer, 1981). Similar results could be seen in Pakistan also. This success couldn't be gained for rice production in India and Bangladesh, but tremendous results could be seen in Pakistan and Sri Lanka, where rice production increased by 80% and 50% respectively (Farmer, 1981).

During the Green Revolution period, the governments made additional investments in irrigation systems, since it is necessary for cultivation of HYVs. The consumption of the plant nutrients was also significantly increased as a consequence of the Green Revolution. These practices were supported by the governments with increased government spending on agriculture and credit schemes and subsidies on fertilizers for farmers. Figure 13 and 14 show the expansion of crop fields and intensity of fertilizer usage, induced by the Green Revolution.

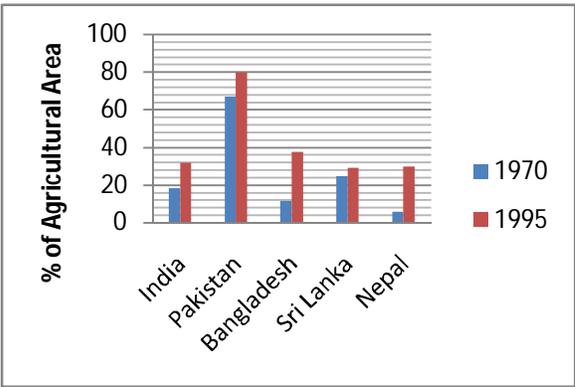


Figure 14. Irrigated areas as % of agricultural areas

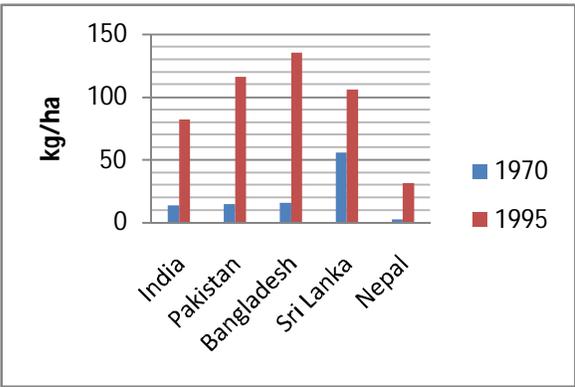


Figure 13. Fertilizer usage

Source: (Rosegrant & Hazell, 2000)

2.4.2.i) *Increased Food Production*

Green Revolution technologies increased both cereal yields and production (Figure 15 and 16), especially in India, where the technologies were thoroughly adapted by the states of Punjab, Haryana and parts of Uttar Pradesh (Rorabacher, 2010). Vast areas of South Asian lands were cultivated with HYV, which may be the reason for the increased crop production. During 1967-1993 in India alone, the area of HYVs of wheat cultivation was increased from 3.9% to 90% of the total wheat cultivated areas (Economic Survey, 1993). The surplus production of many South Asian countries expanded their export opportunities and prevented the massive

starvation, which could have taken place in India during mid 1990's (Rorabacher, 2010).

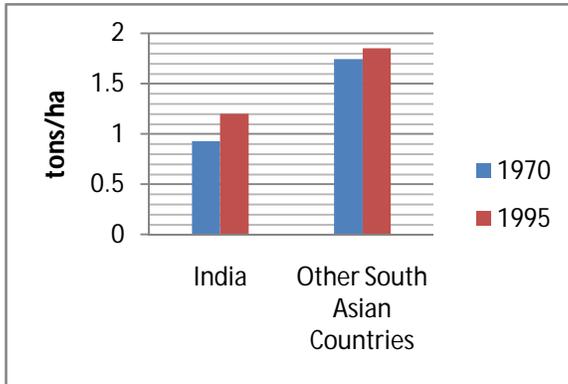


Figure 15. Cereal Yield

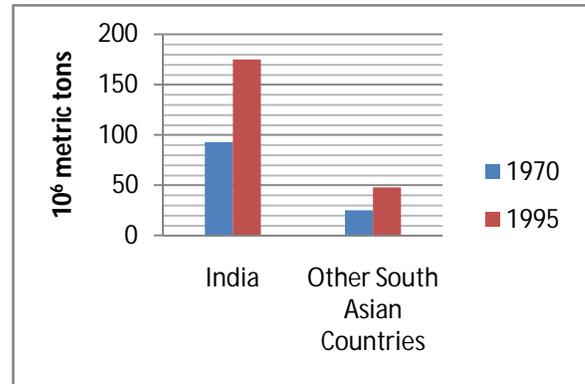


Figure 16. Cereal Production

Source: (Hazell, 2009)

2.4.2.ii) *Income generation*

The Green revolution made poor people produce their own food and make income by selling the surplus harvest (Figure 18.). Also, cheaper commodity prices allowed them to afford more nutritious food. Cultivation of HYV resulted increased per capita food supply, thus increasing the daily protein and calorie intake of the rural poor (Figure 17.) (Hazell, 2009). Even though the regional poverty data is unavailable for South Asia, the absolute number of poor people in the developing Asia declined by 28% from 1975 to 1995, and in India alone, the number of poor people declined by 9% (Hazell, 2009). This was influenced by application of new extensive agricultural technologies, for which the skilled labor power was in demand (DFID, 2004). In India, increase of Agriculture growth rate by 1%, in return increased the industrial output in 0.5% and the national income growth rate in 0.7% (Rangarajan, 1982).

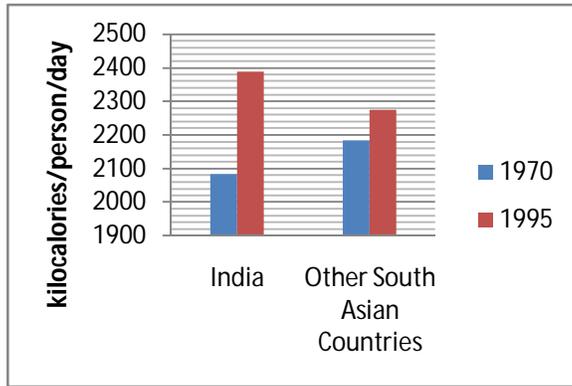


Figure 18. Growth of Daily Calorie Intake

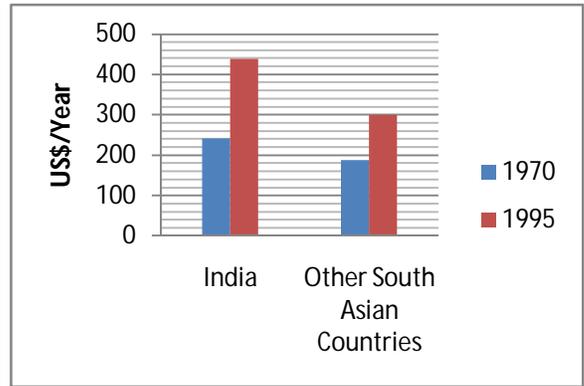


Figure 17. Growth of Per Capita Income

Source: (Hazell, 2009)

2.4.2.iii) *Outputs for public investments*

The governments of South Asian countries invested in different aspects of agriculture sector including rural infrastructure, fertilizer subsidies, credits, and agriculture research and development, anticipating those investments to be justified by the outputs. A forty yearlong study done in India has proved that the marginal outputs of economic growth and poverty alleviation with regard to the public spending, was impressive during the early 1960's, but most outputs gradually decreased, except for spending on R&D (Figure 19) (Fan, Gulati, & Thorat, 2008).

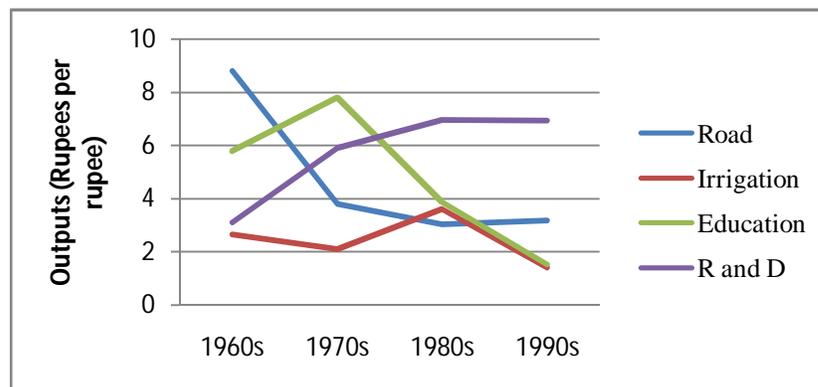


Figure 19. Economic outputs with regard to various agriculture related investments: India (Hazell, 2009)

Chapter 3: The Dark Side of the Green Revolution

The expansion of cultivated area, which was popular before 1965 to increase the crop production, was replaced by cultivation of HYV, introduced by the Green Revolution. With the impressive results, farmers quickly adapted this new methodology which involved with application of fertilizers, pesticides and newly invented irrigation techniques. As true as it eliminated hunger and uplifted the economic conditions of the South Asian countries, scientific evidence prove that the Green revolution is quite unsuccessful in rural poverty eradication and sustainable utilization of the environment (Setboonsarng, 2006), hence failed to achieve sustainable development in the poor regions.

3.1) Social concerns

3.1.1) Less benefitted rural poor

The relationship between the green revolution and poverty eradication is very complex, that different authors have expressed different opinions (Hazell, 2009). However, plenty of literature explains the fact that the benefits of the green revolution couldn't be absorbed by the poor farmers in rural areas, due to the lack of access to advanced agricultural technology. Urban farmers were equipped with better facilities to succeed in the green revolution, which forced poor farmers to struggle with pressure to reduce commodity prices, increased input prices, increased rents and landlessness (Andersen & Hazell, 1985). In South Asia, many rural areas are rain-fed areas without proper irrigation systems, which are unfavorable for Green Revolution strategies (Pingali, 2012). Therefore, rural poverty still remained high, while the better off large-scale farmers absorbed most of the benefits. An empirical study done in India has shown that the Green revolution technologies are neutral that it had neither negative nor positive impacts in poverty reduction (Das, 2002).

3.1.2) Increased inequity

South Asia needs agricultural methods of eradicating both poverty and inequity (Falcon, 1970). It is argued that the benefits of the green revolution were not evenly distributed, and in this case, rural farmers became extremely polarized, which increased the inequality gap between the rural and urban areas. In some regions, small-scale farmers had limited access to credits to purchase fertilizers and pesticides, compared to large-scale farmers and this made them avoid planting the HYVs (Feder & O'Mara, 1981). Technology has caused reduction of employment opportunities especially for women, by mechanizing their traditional manual work such as post-harvest practices. Most technology-intensive works were assigned for male counterparts and women farmers were largely missed, without proper measures to address their social needs (McIntyre, Herren, Wakhungu, & Watson, 2009).

3.2) Environmental concerns

The technological breakout during the green revolution and its nature of input responsiveness in terms of fertilizer, irrigation and machinery, put a huge pressure on the environment, land and natural water resources. Those activities were promoted by the governments through subsidy programs, and many uneducated and illiterate farmers got access to these new techniques, which they used excessively, without proper training (Hazell, 2009). The HYVs were more responsive to external inputs, but proper policy implementation and research to clarify the limits of inputs, were lacking at that time (Evenson & Pingali, 2007). Due to this, some severe environmental impacts of land degradation, water pollution and scarcity and increased CO₂ emissions were evidenced during and after the Green Revolution era.

3.2.1) Land degradation

Numerous studies done in the South Asian region have indicated that a significant amount of agricultural land is already degraded. One study provides evidence that 1/3 of South Asian agricultural lands are degraded to some extent, and 40% are moderately or severely degraded (Young, 1993). Land degradation causes declining of potential yields, increased input requirements, lowering the land value or value of land use, and land abandonment (Scherr & Yadav, 1996). Excessive or poorly designed irrigation systems may result in water logging and desalination, which eventually reduces the crop yield, or even kill the plants (Postel, 1989). In Haryana, India, where Green revolution strategies were heavily practiced, the water table is increasing annually by 1m, and salt patches have started to appear (Singh, 2000) and in the mid-1980s in India, 4.5 million and 6 million ha of irrigated land were degraded by salinization and water-logging respectively. In the mid-1990s in Pakistan 26% of total irrigated land had been degraded by salinization (Ghassemi, Jakeman, & Nix, 1995).

3.2.2) Water issues

Excessive irrigation practices may overuse both groundwater and surface water sources, ultimately leading to water scarcity. When groundwater is excessively used in a way that the water draft is higher than the water recharge, the ground water table will become deeper, forming dark zones (Singh, 2000). This causes drying out of aquifers and induces user conflicts for water. For example in early 1990's in Punjab, India, where tube wells were used for irrigation, the groundwater table was negatively balanced in 50% of agricultural regions, and the rate of water draft was twice of the rate of water recharge (Singh, 1991). Canals also cause problems since they alter the natural water occurrence and examples of flood damage in low-lying areas can be seen in Bangladesh (Fitzgerald-Moore & Parai, 1993).

3.2.3) Pollution

Excessive pesticides and fertilizers may dissolve into the local water ways and pollute both surface and ground water sources. This may contaminate drinking water, pollute surface water and become harmful for wildlife. In Bangladesh, the main reason for the declining of fish is the presence of pesticides in fresh water (Government of Bangladesh, 1992). The exposure of the farmers to contaminated environment, caused serious health hazards. During 1975 to 1996, in Sri Lanka, deaths caused by pesticide poisoning were around 1500 a year (Wilson & Tisdell, 2000). The air-sprayed pesticides are lethal even to beneficial insects, thus diminishing their ecological services. The problems became complicated when the pests became resistant to the commonly applied pesticides, and even more pesticides had to be applied (Hazell, 2009).

3.2.4) Loss of Biodiversity

Green revolution practices caused reduction of both floral and faunal biodiversity. The diverse traditional crops were replaced by monocultures of HYV, which in return reduced the biodiversity of the croplands. In Bangladesh, 67% acreage of the traditional wheat crops were replaced by a single type of HYV and in India, 30% was replaced in 1984 (Khan & Shah, 2009). Likewise, few types of HYVs were ploughed in vast areas, and this reduced the land available for traditional crops. Reduction of the crop biodiversity altered the available nutrient diversity of the staple food. Furthermore, introduction of the monoculture methods decreased the interest of the indigenous people to cultivate the traditional varieties, which was a negative impact on their traditional skills (Khan & Shah, 2009). However, some studies argue that Green Revolution stopped vast areas of forests being cleared off for agricultural land, since HYV increased the crop yield/ha without land expansion (Hazell, 2009).

3.2.5) GHG emission

Studies have proved that the ratio between output energy to input energy is lower than that of the traditional agriculture methods that it has displaced, and with the new technologies, more input energy has to be applied to obtain output energy as food, which is quite inefficient (Shiva, 1991). Greenhouse gas emissions are induced by clearing of forests for agricultural land, application of nitrogenous fertilizer and fermentation of livestock wastes, operation of farm machinery and production of fertilizers and pesticides.

With all these social and environmental concerns, the sustainability of the Green Revolution is highly questioned and criticized. Some scholars demand a second Green Revolution with solutions to overcome these drawbacks, such as organic agriculture with proper policy changes to strengthen the aspects of poverty eradication and social equity. But will agriculture itself provide solutions? The world population is rapidly increasing and land become more and more scarce. The ecological values cannot be compromised with excessive usage of chemicals to induce the production, since the life and ecosystems on earth are interconnected. Organic agriculture may be a good solution but it can be costly for developing countries. With all these questions in hand, humankind will have to find alternatives to survive in a challenging environment in the near future.

Chapter 4: Beyond the Green Revolution

Without a doubt, the Green Revolution has been a helping hand for the majority of the poor South Asian people to emerge from their difficult lives. As beneficial as the Green Revolution was for the South Asian region to overcome the possible famine and uplift their income levels, its negative impacts on many aspects have

led decision makers to think twice, if the same methods should be carried on in the future. The social and the environmental costs of the aftermaths of the Green Revolution has weakened its powers of being the only possible way of increased food production as once considered (Shiva, 1991). Green Revolution technologies barely fit into the frameworks of modern development concepts (i.e., Millennium Development Goals) with components of human development together with environmental sustainability. As elaborated in the previous chapter, the Green Revolution has caused disastrous impacts on environments such as pollution, land scarcity and degradation, reduction of biodiversity and drying off of water resources.

The global scientific community has its expectations on a second Green Revolution, which is based on the concept of sustainable agriculture. But the real question is the practicability of the concept. “Sustainable agriculture” generally includes the components of efficient and stable production, inexpensive inputs, food security, conserved biodiversity, equity, and community based management (Conway & Barbier, 2013). According to Conway and Barbier, succeeding sustainable agriculture is a difficult task, since the practical applications of it, usually include tradeoffs, and choices have to be made on one aspect over another. Land-based agriculture has come to a phase that its limitations drive the world towards other possible alternatives. The world population is expected to be increased up to 9.1 billion in 2050, and food production must be increased by 70% to feed them (FAO, 2009). Developing regions such as South Asia have the highest pressure, since those are the regions that have the highest population increments. In this situation, critical decisions will have to be made regarding food production and food security, poverty eradication, living space and living conditions, and environmental sustainability. Land availability is becoming scarce due to the conflicting demands of land uses, land degradation and climate change. There is virtually no suitable extra land available for agriculture expansion in

South Asia in the future (Fischer, Hizznyik, Prieler, & Wiberg, 2011). Therefore, this may be a critical constraint for possible future agriculture expansion.

Sir Arthur C. Clarke once mentioned “How inappropriate to call this planet Earth when it is quite clearly Ocean” (HOPE, 2014). This reminds us of the fact that 70% of the earth is covered by oceans which enclose a vast repository of natural resources. If the world is running out of access for land-based resources, oceans provide the next best solutions. For the past half of the 20th century, the developing countries relied on agriculture to overcome poverty and hunger. Yet it quite wasn’t successful, since the environmental and social costs were significant. Therefore, it is very much necessary to look for another paradigm to achieve sustainable development of humankind, as well as the environment.

4.1) Green Economy in a Blue World

The global agenda for sustainable development, set by the 1992 Earth Summit and the 2002 World summit, was reassessed by the United Nations Conference on Sustainable Development, “Rio+20”, held in Rio de Janeiro, Brazil in June 2012, since the original expectations of those conferences had not been adequately achieved. Twin themes were discussed in the Rio+20 conference namely, Green Economy in the context of Sustainable Development and arrangements of institutional frameworks for Sustainable Development. There, poverty was reaffirmed as a major challenge for the Sustainable Development and the Green Economy should be the path to eradicate poverty and achieve Sustainable Development. “The future we want”, a report synthesized at the conference with its outcomes, elaborates the commitments of the Green Economy as:

“We consider Green Economy in the context of sustainable development and poverty eradication as one of the important tools available for achieving sustainable development. We emphasize that it should contribute to eradicating poverty as well as

sustained economic growth, enhancing social inclusion, improving human welfare and creating opportunities for employment and decent work for all, while maintaining the healthy functioning of the Earth's ecosystems.”

The term Green Economy has been mentioned in governmental advisory reports and international statements and discussions before it became one of the major themes of Rio+20. However, Rio+20 made the concept much more internationally popular. Organizations such as UNEP, IUCN and UNCTAD have released numerous scientific publications on the Green Economy and many scholars have themselves defined the concept. Even though there is no internationally agreed single definition for the term Green Economy, the definition declared by the UNEP quoted as, “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. It is low carbon, resource efficient and socially inclusive” is widely used (Allen & Clouth, 2012).

The following interesting statement is quoted from the “Green Economy in a Blue world” a Synthesis report, produced by the UNEP in 2012.

“A worldwide transition to a low-carbon, resource-efficient Green Economy will not be possible unless the seas and oceans are a key part of these urgently needed transformations”

4.2) Blue Economy: The Oceans' role as development spaces

Giving power to the above statement, during the preparatory process for Rio +20, Pacific Small Island Developing States (SIDS), whose economy is greatly dependent on the oceans and its resources, came up with the concept of “Blue Economy”, where they demanded the consideration of the value of the marine environment for the sustainable development of their states (Ebrahim, 2012). The

Blue Economy concept defines oceans as “Development Spaces”, which integrates spatial planning with various oceanic economic activities and denies the “Brown” development model, which has made oceans, sites of free resource extraction and waste disposals (UN Conference on SIDS, 2014). It has been widely admired by states like China, Korea, Indonesia the European Union and many other coastal states. The Rio+20 processes could strengthen the institutional arrangements to expand the “Blue aspect” of the Green Economy and moreover, there is a growing admiration of the Blue Economy by many other regional and international initiatives (UN Conference on SIDS, 2014).

The same term “Blue Economy”, is also used for the concept that has been coined by Dr. Gunter Pauli in 1994, which is a business model based on ecologically inspired innovations to manufacture products that everybody can afford. The name here is influenced by the color of the sky and the water. Even though the expectations are similar, Pauli argues that the Green Economy is costly and valid till the global economy is expanding, therefore a change of the Green Economy policy framework is in demand (Pauli, 2009). This concept is not to be confused with the “Blue Economy”, proposed by the Pacific SIDS, which is discussed here.

From the surface to the bottom, the oceans create a treasury for the life on earth. It is with special importance to the humankind since millions of people depend on it for their food and livelihoods, which are more obvious uses. The ocean resources may vary from cheap animal proteins to deep sea minerals, in which people rely on for their subsidies or probably determine the entire nations’ wealth. Oceanic routes facilitate the most efficient transportation systems in the world and the scenic beauty of the beaches attracts tourists and thousands of locals make direct and indirect income out of it.

The ecological services of the oceans are very significant, and they house the largest ecosystems on the planet. Coral reefs, sea grass and algal beds, deep water habitats and coastal habitats such as mangroves and sand dunes sustain marine and

coastal biodiversity. They in fact provide feeding and breeding grounds for fish, crustaceans and many other vertebrates and invertebrates. These coastal habitats line the coastal belt and protect it from shoreline erosion and natural disasters such as Tsunamis. Oceans are the main driving forces of global climate and a major sink of atmospheric CO₂. The conveyor belt of thermohaline circulation is driven by the deep oceanic currents, which makes life possible in and beyond the tropical regions.

4.2.1) Blue Economy for South Asia: Potentiality and opportunities

The Blue economy concept is recommended to be implemented by any coastal state with interests in ocean-based industries. The Blue Economy Summit, organized by the Government of Seychelles and the United Arab Emirates, was held in 2014 in Abu Dhabi and the “Abu Dhabi Declaration” was adopted to recognize the importance of the marine environment, mitigations and adaptation to climate change, governance and financial frameworks at national and international levels, and scientific and technical capacities (SIDSnet, 2014). The Blue Economy is getting its reputation throughout the world, and spreading from the Pacific SIDS to even the Southern African region. Eight coastal states of the Southern African Development Community (SADC) are willing to adapt the concept into their development strategies, based on their own priorities (Ngwawi, 2014).

As the proud owners of the mighty Indian Ocean, perhaps the Blue economy may be successfully implemented in the coastal South Asia. Even though the region is famous for fisheries, shipping, hydrocarbons and other ocean-related industries, its operations in the framework of blue economy is poorly observed. Before coming into any firm conclusion, it is important to recognize the available blue economy opportunities in the region and how the countries are performing. Figure 20 shows the areas of maritime zones under national jurisdictions of the South Asian countries.

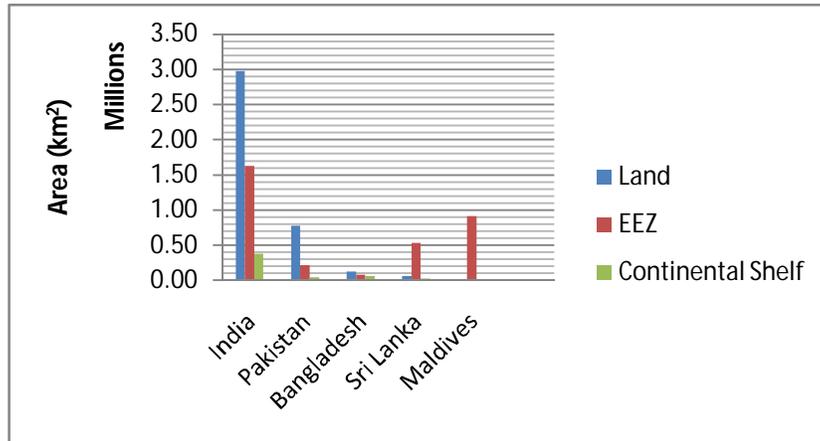


Figure 20. Land, EEZ and Continental Shelf Areas of South Asian Countries (The World Bank, 2014; Sea around us project, 2014)

The important observation here is that Sri Lanka and Maldives, which are both island nations, have more maritime area than terrestrial area, which means that they have much wider opportunities in the oceans than what they have on the land. Being signatory to the United Nations Convention on the Law of the Seas (UNCLOS), within the EEZ, a coastal state has the sovereign rights to exploit and explore living and non-living natural resources in the water column, seabed and the subsoil (UNCLOS-Article 56). Over the continental shelf, the coastal states entertain the sovereign right to explore and exploit natural resources such as minerals and other nonliving resources, or living resources that are in contact with the seabed (UNCLOS-Article 77). Interestingly, all the above states have lodged submissions for extension of the outer limits of the continental shelf, to the Commission on the Limits of the Continental Shelf (CLCS, 2014). This emphasizes the fact, that all have a growing interest in the seabed exploration, which is a green light for the Blue Economy. The revenues from the nonliving resources, made through the extension, have to be shared with the international community through the International Seabed Authority, which in return benefits the least developed and land locked countries (Schoolmeester & Baker, 2009).

4.2.1.i) Fisheries and Aquaculture

The main expectation of fisheries and aquaculture is to produce cheap protein and create livelihoods. Fish is becoming one of the major food commodities, mostly because of its affordable nature, compared to other animal products. Fish are generally considered low in calories and high in protein, nutrients and Omega-3 fatty acids. Per capita fish consumption has been increased by 4.3% in India alone and 3.3% in the rest of the South Asian region, from 1985 to 1997, which is primarily a phenomenon in developing countries (Delgado, Wada, Rosegrant, Meijer, & Ahmed, 2003) In 1993, the percentage of fish protein as a source of animal protein, was 51.5% and 46.7% in Sri Lanka and Bangladesh respectively (Subasinghe, 1997). Aquaculture, one of the fastest growing food production sectors, provides solutions for marine fisheries depletions while creates job opportunities.

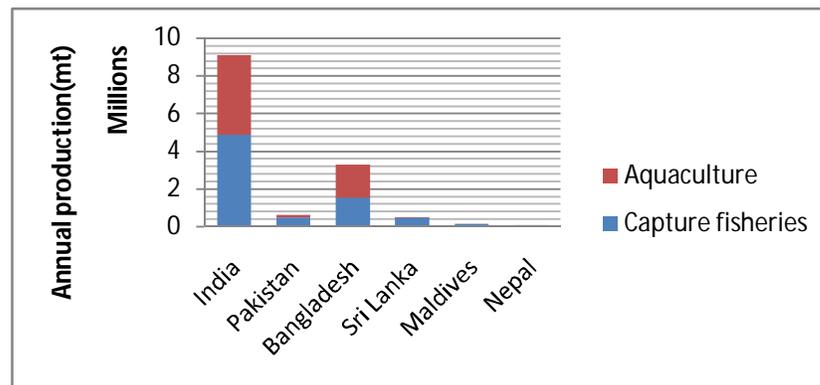


Figure 21. Annual fish and aquaculture productions in 2012 (FAO, 2014)

The capture fisheries in the Asian region, generally follows a stable trend with very dramatic changes in the South Asian region. Changes may vary from 5% to 8% with decadal increase of 28%, which is basically due to the increase of fishing effort, expansion of fishing area, and good management practices (Funge-Smith, Briggs, & Miao, 2013).

Most of the recent published data for the South Asian region is recoded, as it is within the Bay of Bengal, where it excludes the west coast of India and Pakistan, or separately as the Western and the Eastern Indian Oceans, where Pakistan and the West coast of India belong to the Eastern Arabian Sea of the Western Indian Ocean (FAO area 51) and the rest to the Eastern Indian Ocean (FAO area 57). Within last few years, the catches from the Western Indian Ocean shows a slight decline after a fast growth during the 1980s to 1990s (FAO, 2011). In the Western Indian Ocean, the Eastern Arabian Sea accounts for 60% of the total catches, with yearly contributions of 2.5 million tons from India, 400 thousand tons from Pakistan and 100 thousand tons from Maldives (FAO, 2011). There, current Indian catch remains stable and Pakistan's and Maldives's contributions are slightly declining. Catches of the Eastern Arabian Sea majorly include Indian oil sardines, Bombay ducks and shrimp, and there is a growing fishing potential from The Indian fisherman due to the open access fishing regime of India (FAO, 2011). Data of the fishing potential of Pakistan and Maldives is rare.

The eastern Indian Ocean is significant due to the high coastal population density, and its vulnerability to natural disasters, and the fact that the marine living resources are being overexploited due to the high dependency. Over 400 million direct and indirect jobs are facilitated by the Bay of Bengal region. These employment opportunities may vary from fishing to post-harvesting activities. The majority of the catches of the Eastern Indian Ocean include miscellaneous fish such as croakers, drums, Bombay duck, Tuna and tuna-like fish, herrings , Indian oil sardines, shrimps, prawns and shellfish.

Aquaculture production of the South Asian region (Figure 21) accounted for 613, 8043 tons, at a value of 12.2 billion US\$ in 2010, which is equal to almost 8% of the world total aquaculture (Funge-Smith, Briggs, & Miao, 2013). The production is generally dominated by fresh water fish such as Indian carps, since freshwater water availability in the region is quite high. High productions of Mrigal

(*Cirrhinus mrigala*) is recorded from India and Bangladesh, grass carp (*Ctenopharyngodon idella*) from Bangladesh and Pakistan, common carp (*Cyprinus carpio*) and Orange fin Labeo (*Labeo calbasu*) from Bangladesh, and Tilapia (*Oreochromis* sp.) from Sri Lanka (Funge-Smith, Briggs, & Miao, 2013). Even though, there is a rapid growth of culture of aquatic plants, it still doesn't contribute a considerable share to global production dominated by China and Japan. Molluscan culture is a growing industry, accounting for 5% of the global molluscan production and it is dominated by India, producing green mussels (*Perna viridis*) and Indian backwater oyster (*Crassostrea madrasensis*) (Funge-Smith, Briggs, & Miao, 2013). South Asian mariculture remains minor at the world scale, contributing only 0.13% to world mariculture in 2010, with significant contributions from India and Bangladesh (Funge-Smith, Briggs, & Miao, 2013). Crustacean culture in the South Asian region contributes 4% to the global production, with high valued giant tiger prawn (*Penaeus monodon*), mostly from India and Bangladesh (Funge-Smith, Briggs, & Miao, 2013).

4.2.1.ii) *Maritime Transportation*

Shipping is the most cost-effective mode of transportation in the world, which carries 80% of the global merchandise trade volume. Shipping becomes even more important for developing regions such as South Asia, because they are the places where the most goods are loaded onboard. Economies of scale of shipping reduce the transport cost and provide access to larger markets. Developing countries get economic benefits from lower shipping costs and prices, decided by the competitive markets. Trade itself doesn't have a clear relationship with poverty eradication. However, willingness for trade is one of the major requirements for economic growth. It generates employments and earns revenue by exports or providing trading (port and logistic) facilities, moderate consumer prices and government spending, which ultimately affect the poor (WTO, 2008).

The South Asian regional economy is growing rapidly, even though the rate is not sufficient to withstand poverty. The regional maritime transportation system is well linked to the global network. From 2006 to 2011, UNCTAD Liner Shipping Connectivity Index (LSCI), which indicates the connectivity and the capacity of the shipping sector of a country to the global shipping network, showed an increasing trend for countries such as Sri Lanka, Pakistan, and India, and a marked a declining in Maldives (Figure 22) (De, 2013). Increased LSCI indicates reduction of cost of shipping, which in return enhances the market competitiveness and increase container traffic (ESCAP, 2012). Sri Lanka’s geographical position has a certain advantage over the other countries in the region, since it provides the lowest deviations from the main shipping routes, in terms of cost and time (Weerakoon & Perera, 2014). The recent Colombo harbor expansion project is aimed at providing maritime hub services for the South Asian region and widening the future opportunities in maritime business in the country.

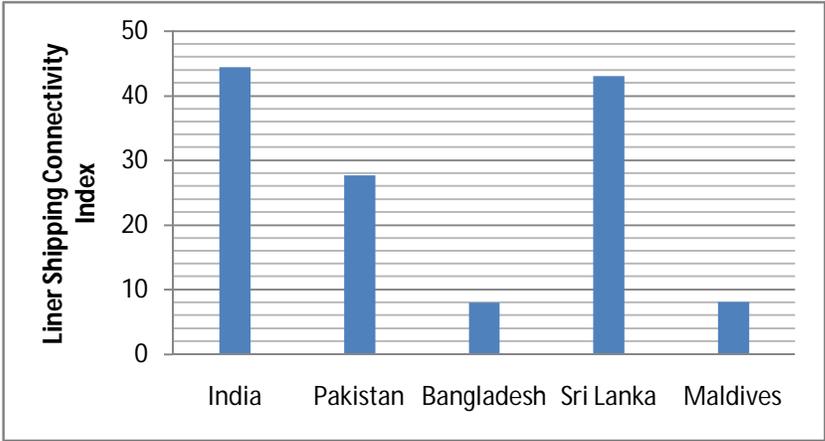


Figure 22. . Liner Shipping Connectivity Index 2013 (The World Bank, 2013)

Bangladesh, India and Pakistan are renowned Ship-breaking countries. The ship breaking industry in Bangladesh represents 70% of the global total, providing 200000 direct and indirect jobs, and around 200 ships are dismantled annually in Indian scrapping yards (Puthucherril, 2010). Pakistan accounts for around 10% of

the global industry (Muhammad & Iqbal, 2013). It is the main source of steel in these countries, which reduces the necessity for mining, and make revenue for the government. However, the ship-breaking industry of South Asia is being severely criticized worldwide. Though it occupies a major position in these countries' development strategies, it makes revenue out of cheap unskilled labor power and subsequent environmental concerns have questioned the reputation of the industry.

4.2.1.iii) *Coastal and marine Tourism*

Coastal tourism is one of the fastest growing sectors in the world. For last few decades, shore-based coastal tourism was much popular, as it refers to the “3 S” slogan “Sun, Sand and Sea”. Nowadays, there is an emerging interest of beachgoers to enjoy the marine environment as a whole. The consumptive and non-consumptive recreational uses of the marine environment, generally includes fishing, shell collection, bird watching, sun bathing, wind surfing, scuba diving and boating etc. Coastal tourism is a very dynamic sector that it constantly becomes more diverse and expanded, which requires attention of governance plans (Hall, 2001). Even though the global tourism sector boomed in the 1990's, with 9% average annual growth rate, the sector, later struggled with the aftermaths of natural disasters, terrorist attacks, diseases and the economic rescission, but eventually recovered (Honey & Krantz, 2007). Tourism expands opportunities of poverty eradication, by creating employment, and increasing and diversifying income. The World Trade Organization (WTO) has stated a number of advantages of the tourism industry, as a tool for pro-poor growth. Increasing market opportunities and access to international markets, valuing natural capital that are assets of the poor, demanding labor power, facilitating wider stakeholder participation, and empowering women, are among them (WTO, 2002).

The South Asian coastal region is blessed with warm tropical climate, high coastal biodiversity, clear water and long sandy beaches. However, the current performance of the South Asian region in the global picture is not as impressive as

it is in neighboring East and Southeast Asia. In 2007, South Asia welcomed only 1.1% of 898 million visitors around the world, while Europe and East and Southeast Asia received 53.5% and 19.3% respectively (Alwis, 2010). One reason for this decline is the 2004 Boxing Day Tsunami, which caused massive damages to the South Asian economy. However, it has been forecasted that in 2020, the arrivals at South Asian destinations will increase up to 18.8 millions, which is a 6.2% average annual growth rate from 1995, and its market share will increase from 0.7% in 1995, up to 1.2% in 2020 (WTO, 2000). This average annual growth rate will only be below the rates of Middle East and East Asia and Pacific regions, which will be 7.1% and 6.5% respectively (WTO, 2000).

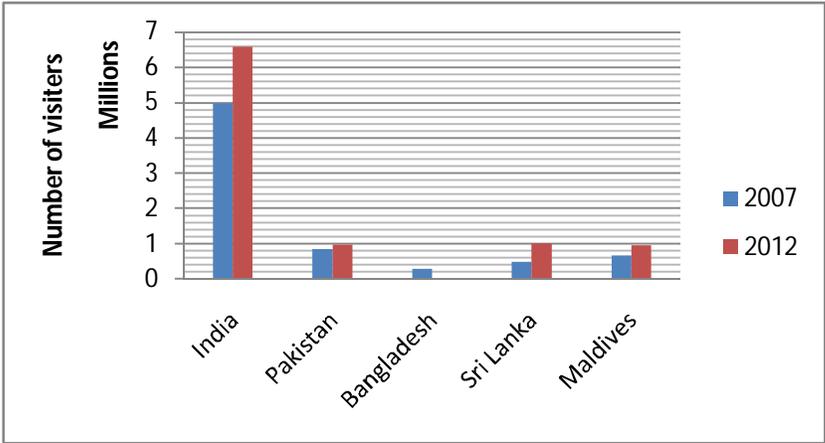


Figure 23. International arrivals in 2007 and 2012 (The World Bank, 2014)

India dominates the regional tourism sector with almost 5 million travelers in 2007 and 6.5 million in 2012 (Figure 23). The past was rough for the Indian tourism industry, due to the war and security concerns, but appropriate policy changes have overcome those difficulties. Coastal tourism plays a significant role in the economy of Pakistan, but the industry is being threatened by the prevailing security conditions and political instability (Ullah, Johnson, Micallef, & Williams, 2010). The decline of Sri Lankan tourism in 2007, is mainly due to the civil war and Tsunami impacts during that time (Alwis, 2010), but the current situation is

much better, with 1.3 million tourist arrivals in 2013 (SLTDA, 2013). Sri Lanka is famous as an ecotourism destination, with sandy beaches, fringing reefs, marine flora and fauna. Maldives's economy greatly depends on tourism. It is an archipelagic nation comprised of 1190 islands and 15% of the total visitors to Maldives are divers who enjoy the underwater beauty (Kundur, 2012). Tourism is the largest industry of Maldives, where almost 90% of government revenues come from, and in 2009, its GDP share was 28% (de-Miguel-Molina, de-Miguel-Molina, & Rumiche-Sosa, 2011). Small island nations are highly vulnerable to natural disasters and climate change. One example is the 2004 Indian Ocean Tsunami, which caused 470 million US\$ damages to Maldives's economy (IMF, 2005).

4.2.1.iv) *Marine-Based Energy*

Energy is a major requirement for economic development and social welfare. It has been proved that energy consumption and GDP growth are positively correlated (Bartels, 2007). The South Asian region has the lowest per-capita energy consumption levels in the world, in which most people still depend on non-commercial energy sources, such as animal waste, wood and biomass. However, the commercial energy demand of the South Asian region is increasing at an annual rate of 4.2% (Jaswal & Das Gupta, 2006). The commercial energy combinations majorly include coal and petroleum, with minor contributions from natural gas, hydropower, and a few other sources. Over the next five years, the Asian region will increase its expenditure on the offshore oil and gas infrastructure by 54%, with 17% contribution from the south Asian region, which is below to contributions of 64% and 19% from Southeast Asian and East Asian regions respectively (Infield, 2013).

The three main sectors of the petroleum industry, namely upstream, midstream and downstream, are represented by exploration and production, transportation and refining, and redistribution. All these activities are vital for economic development. There are proved oil and natural gas reserves in the South Asian

region, but they are not important at global scale, except for India (Figure 24, 25, 26 and 27).

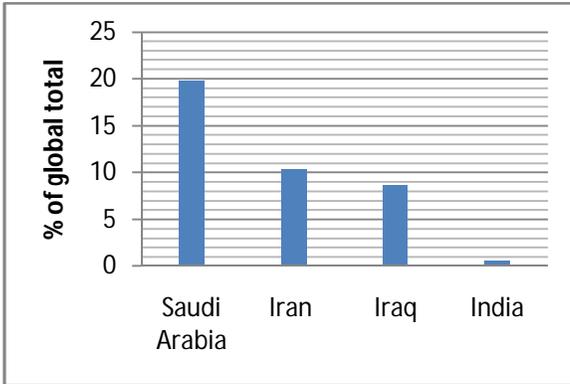


Figure 24. Share of global total oil reserves

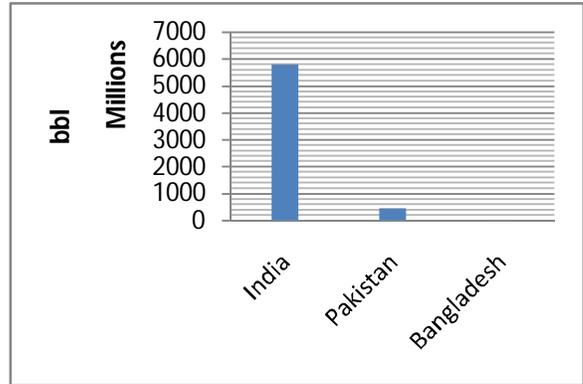


Figure 25. Offshore oil reserves

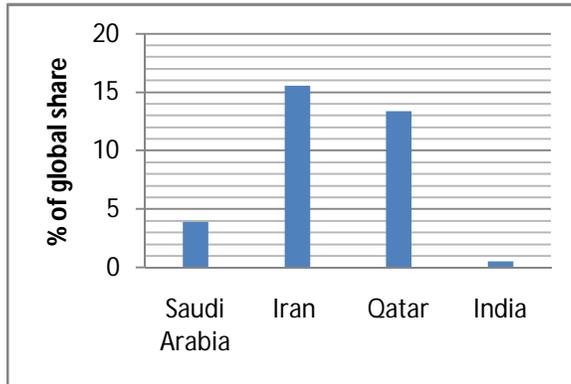


Figure 26. Share of Global Total Gas Reserves

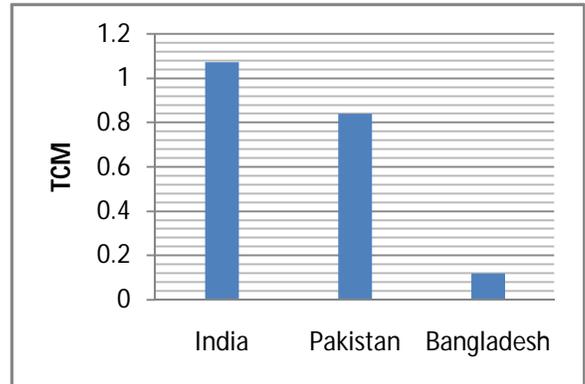


Figure 27. Offshore gas reserves

Source: (bp, 2011)

India is the 4th largest crude oil and petroleum consumer and was also the 4th largest importer in the world in 2013, with a demand of almost 3.7 million barrels per day, which is to be increased up to 8.2 million barrels per day in 2040 (EIA, 2014). This amount is much higher than the current production, and the government is expanding exploration activities and diversifying supply sources. The growing gap between demand and supply will enhance the future opportunities in all three sectors of the industry for India. The geographical

position of Pakistan has favored it as an area of oil and gas reserves, but the offshore reserves are still underexplored. The Indus basin of Pakistan consists of the second largest submarine fan system in the world, which is similar to the Niger and Nile deltas with rich oil and gas reserves and it still remains underexplored (Government of Pakistan, 2014). Maritime boundary disputes between Bangladesh and Myanmar have been a drawback for the offshore gas industry of Bangladesh, which may result in security issues in the future.

The world's petroleum resources are under the pressure of high demand, and concerns of high CO₂ emissions tend to hinder the objectives of sustainable development. Therefore, growing energy demands of the South Asian region have to be supplemented by alternative means. Coastal states have the geographical advantages of waves, tides and winds, which can be used to generate renewable energy. Most South Asian countries have long coastlines, which are ideal for generation of renewable energy, but currently available practices in the region are very limited and data are scant. India is very successful in onshore wind farms and is considering designing offshore wind farms in the future. Tamil Nadu, Gujarat and Maharashtra coasts have been identified as potential sites, with 350GW estimated capacity (Government of India, 2013). India is expanding its interests towards tidal energy plants as well. Gulf of Kutch, Gulf of Cambay and Gangetic delta in west Bengal, have already been identified as potential sites, with 8000 MW cumulative capacity (Paliwal, 2012). Except for the tidal energy, suggestions for wave and thermal energy are still conceptual (Sharma & Sharma, 2013), but the research undertaken by the local research institutes to check the potentiality of the ocean energy generation, is very impressive in the South Asian region.

4.2.1.v) *Deep sea minerals*

Increased material consumption for high-tech machinery has pushed up the global demand for minerals. Long term physical, chemical and biological interactions in the deep sea environment influence the formation of such minerals in the sea bed.

Three main types of minerals, namely Sea-floor Massive Sulphides, Cobalt-rich Ferromanganese Crusts, and Polymetallic (manganese) nodules, are extracted from the sea bed, which are rich in Sulfur, Nickel, Cobalt, Iron and Manganese (UNEP, 2014). Data on the availability of the deep-sea minerals in the South Asian region is rare. However, India again is leading in this aspect. India holds the exclusive right to explore the central Indian Ocean basin and has established two mining sites (Michel & Sticklor, 2012). Also, India is building a processing plant for rare earth minerals, and invested 135 million US\$ on a new exploration ship (Park & Padma, 2012).

Chapter 5: Paradigm shift: Stepping up from land to sea

The Green Revolution and Blue economy share somewhat similar goals in different perspectives. Almost 50 years ago, Green revolution was coined to increase food production to overcome the possible famine and uplift the income levels of the poor. Even though it did succeed in increasing food production, its contribution to poverty eradication and its commitments to environmental sustainability have been highly criticized. The Blue economy on the other hand is much more than about alleviating poverty and hunger. It fits in to the framework of Sustainable Development goals, which interlinks socioeconomic aspects and environmental sustainability. However, the expected outcomes of Blue Economy are no different than that of the Green Economy, which are basically optimized economic benefits, national and gender equity, poverty eradication, more decent jobs and environmental sustainability, but based on coastal and marine resources.

Developing regions such as South Asia are still relying on intensified agriculture to uplift their economies while feeding the expanding population. Developing countries' governments have agricultural policies based on their development

goals and available natural resources, and the percentage government expenditure in agriculture of many developing regions is higher than that of the developed regions. However, there can be complications; that long-term environmental sustainability is quite unrealistic when there is an urgent need to eradicate poverty and hunger. In South Asia, long term intensive agriculture practices have compromised ecological values. Statistical evidences prove that South Asia is one of the most impacted regions in the world, in terms of environmental sustainability. Figure 28 and 29 show two sources of environmental pollution, which are recorded at very high levels in South Asia.

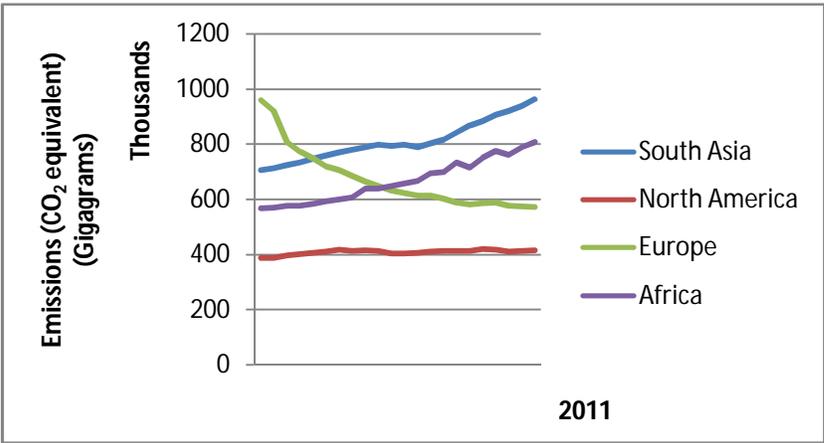


Figure 26. Agricultural CO₂ Emissions during 1990-2011 (FAO, 2014)

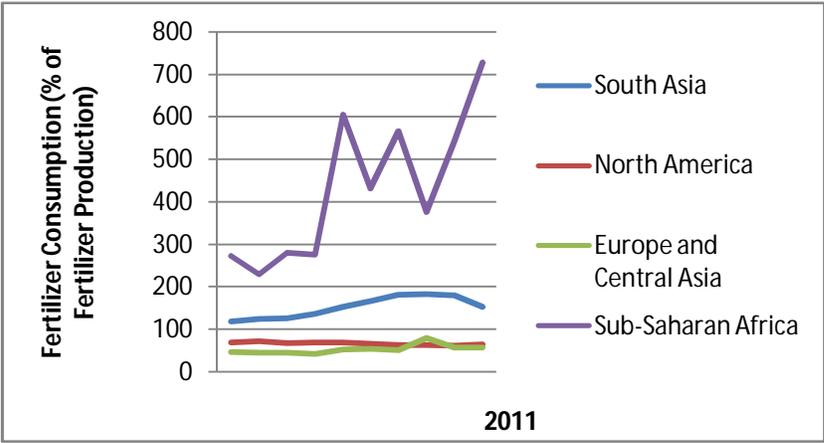


Figure 27. Fertilizer Consumption during 2002-2011 (World Statistics, 2014)

5.1) Importance of the estimation of economical and environmental value of the ocean sector

In the South Asian region, there is no published data on the economic and the social values of the ocean-based industries (Table 1). Consideration in this sense has been given to many aspects of the agriculture sector with numerous worldwide, regional and national databases for values of agriculture production, GDP share, government spending on the sector, number of employment, environmental indicators, effluent emissions, etc. Regarding marine industries, except for capture fisheries and aquaculture, Important economical data are lacking or they are merged with other sectors (eg- Fisheries and agricultural sector data are usually merged). Specially, ocean industry related environmental data, such as industry-wise greenhouse gas emissions, fuel consumption, rate of coastal erosion, coastal water quality and diversity indices of coastal habitats are extremely rare. Lack of data availability restricts the predictions of its performances and complicates the policy integration for poverty eradication

	Agriculture	Ocean Sector
Resources	Land, Water	Coastal ecosystems, EEZ, Continental shelf, High seas, Area.
Opportunities	Food production, Post-harvesting, Agribusiness, Agro-tourism, etc.	Food production, Shipping and ports, Coastal-Tourism, Mineral exploration, Renewable energy, Marine Biomedicine, etc.
Development Strategy	Poverty and hunger eradication	Trade based. No direct involvement with poverty eradication.
Government Expenditure (% of GDP)	Ranked amongst the top sectors.	No clearly allocated share for ocean sector. Spending may be allocated industry-wise.
Contribution to the National GDP (%)	Among the highest contributing sectors.	No clearly compiled data.
Employments	High. Data on number of employments is available	No precise data
Education and training	Well established training colleges, universities and research institutes.	No systemic training is available for other sectors, except for seafaring

Table 1. Qualitative comparison between the socio-economic values of agriculture and ocean based industries

5.2) Sustainability and the Blue Economy

In 1987, the Brundtland report of the World Commission on Environment and Development (WCED), described the sustainability as the “development which meets the needs of the present without compromising the ability of future generations to meet their own needs”. The term was complimented by the UN and started to be popularized among the global leaders and was the core topic in the 1992 UNCED. Sustainability concept includes three solid ideas, namely equity and fairness for the world poor, long term vision for environmental protection and the interactions among the three sustainability pillars (Drexhage & Murphy, 2010).

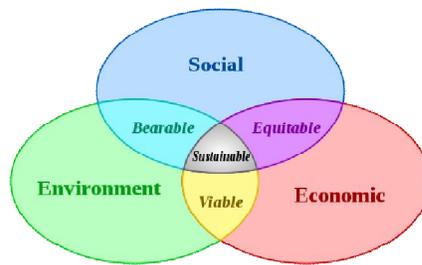


Figure 28. Three pillars of sustainability (IUCN, 2006)

In 1968, as Garrett Hardin suggested, jointly held natural resources are subjected to the tragedy of the commons, which he stated as “Freedom in common brings ruin to all”. This simply means that when natural resources are shared by multiple consumers, it will be eventually depleted by overexploitation. Since the Blue economy has a very strong relationship with natural environment and resources, which are mostly prone to open access, their unsustainable utilization may finally result resource depletion.

5.2.1) Ecosystem Based Management (EBM) for environmental sustainability

The basic approach of the Blue Economy is the optimum usage of marine resources in a way that the environmental costs are not exceeded. EBM is the most commonly practiced management approach for uses of natural resources, which is

different from the traditional single sector management practices, resulting separate governance regimes. It identifies the human interactions with ecosystems and their interdependency. In the EBM, the ecosystem services are maintained by preserving and restoring habitat qualities, which has to be done by management of human activities on the ecosystems (Clarke & Jupiter, 2010). Figure 31 elaborates how sustainability finds its way through the EBM

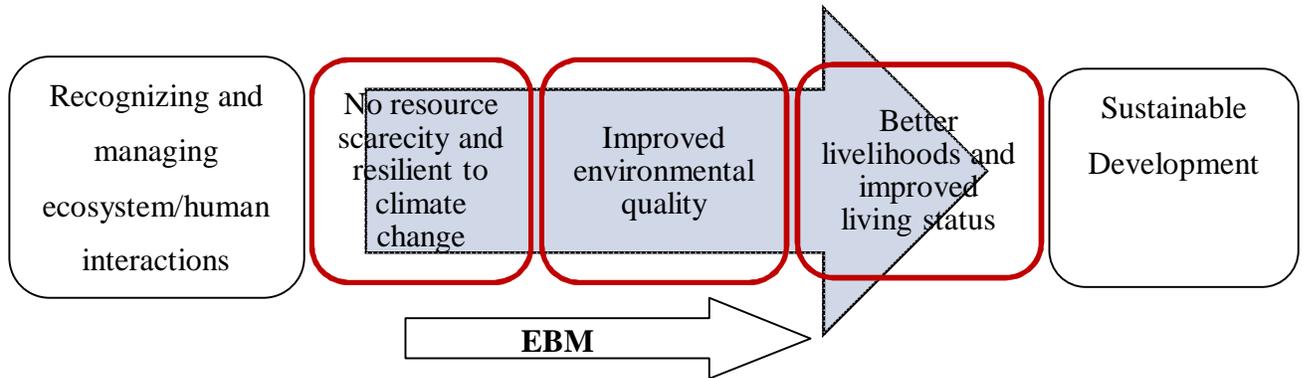


Figure 29. Ecosystem Based pathway of sustainability

Drawbacks of the Green revolution shall be overcome with Blue economy only if implementation fits in to the sustainability framework, where it fulfills social and economic needs while protecting the natural environment for future generations (Figure 30). Table 2 shows the similarities between unsustainable agriculture practices and ocean industries and it is interesting to see how similar and interconnected they are.

Unsustainable Practices		Environmental States and Impacts
Agriculture	Ocean Industries	
Improper land usage/ irrigation	Improper coastal infrastructure	Land degradation, erosion
Excessive usage of chemicals and fertilizers	Dumping of untreated effluents, aquaculture	Pollution, eutrophication
Deforestation of forests for farmlands, exploitation of groundwater sources.	Excessive exploitation of fishing and other resources	Overexploitation of natural resources, loss of biodiversity
GHG emission by machinery and fertilizer.	GHG emission by vessels and port machinery.	Global warming, climate change

Table 2. Environmental impacts of unsustainable Agriculture and Ocean industries

It is clear that regardless of the mode of impact, unsustainable practices of both agriculture and ocean industries may end up with the same environmental states and impacts. Therefore, the Blue economy concept would never be a reality without balancing the three pillars of sustainability with regard to the ocean sector. Otherwise, this will be no different than the Green Revolution, which only uplifted the economic pillar while severely compromising the interactions of environment and social pillars.

5.3) Three pillars of the sustainable Blue Economy

5.3.1) *Economic pillar*

Statistical data is very important to predict the future trends, which in return is useful for proper policy implementation. “Evidence-based policies” help planners make best decisions with best available evidence and it is a requirement in the MDG guide (Segone & Pron, 2008). None of the South Asian countries has such published databases for the whole marine sector, which is a major drawback to analyze their performances over time. Some authors have published sector-wise economic overviews (eg: “Marine-India”, a sector report on Indian Shipping industry (Desai, 2007)), but they are not uniform and difficult to integrate with other sectors to make composite decisions.

Total Economic Value (TEV) of the marine environment consists of both Market-Based and Non market-Based values and usually Market Based values, associated with values of tradable goods and services, are taken into consideration for decision making (Joseph & Gunton, 2009). In many developed countries, all economic activities that are carried out in the coastal and marine environment have been evaluated in terms of their contribution to the regional or national economies. One study in British Columbia states that, Ocean Sector provides sources of extractable resources and opportunities of operations, innovations, recreation and transportation in which governments, private industries and research organizations are depending on (GSGislason & Associates Ltd, 2007). It has identified private

sectors, public sectors and nongovernmental sectors that are involved in British Columbia's marine environment and used Gross Output, GDP, Labor income and number of employment as economical indicators to monetize the value of the marine-based industries. The study revealed that the Ocean-based economy in British Columbia is larger, broader and more diverse than previously estimated. Moreover, the percentage share of the ocean sector to the national economy could be estimated and existing potentials and future opportunities could be clearly identified. The authors have acknowledged that this study represents a substantial coverage of the entire ocean sector of British Columbia, which can be very important for the national-level decision-making process. A similar study done in Nova Scotia, has developed a template to estimate the importance of the ocean industries to their domestic economy (Mandale, Foster, & Plumstead, 1998). The study has identified the coastal zone in two perspectives, as a *resource* and as a *medium of operation, movements and innovations*, in which the first category is impacted by the behaviors of the second category. The maritime domain was categorized in to two sectors as private sector and public sector and four types of data, namely value of spending, direct employment, direct payroll and markets for output, have been considered for estimations. Once the calculations were done, the growth of each industry and its performance could be assessed compared to a benchmark year (1994 in this study). South Asian countries like India, Pakistan and Sri Lanka, should initiate this kind of assessment to determine the total values of their marine sector, since they already have or at least have the potential, for more diverse oceanic industries. India can take a leading role in this respect since it has the largest economy in the region with the largest coastal territory and India is technologically more advanced than all other South Asian countries. A hypothetical template for the industrial economic valuation (market based) is shown below (Table 3). The contents in the table are inspired by similar assessments carried out in many other developed countries (Zhao, 2013; Gardner, Tonts, & Elrick, 2006; The AIMS index of marine industry, 2014).

Sector	Industries	% GDP	Government expenditure	Employments			Labor income	
				Direct	Indirect	% of total employments	Value	% of total labor income
Fisheries	Capture Fisheries							
	Mariculture							
	Seaweed culture							
	Fish processing							
Maritime transportation	Ship building and repairing							
	Port facilities and logistics							
	Equipment retailing							
Marine and coastal tourism and recreation	Accommodation							
	Domestic consumption of goods							
	Cultural activities							
	Leisure diving							
Offshore exploration	Upstream, Midstream and Downstream of oil and gas							
	Minerals							
Marine services	Mapping, Surveying, business consultation							
Other								

Table 3. A hypothetical template to evaluate market based economic values of the ocean sector

5.3.2) Environment pillar

The marine environment consists of numerous ecosystems, where it interlinks life and physical nonliving environment. These ecosystems provide benefits in the form of ecosystem services, which is defined as flows of benefits from nature to people (Brenner, Jimenez, Sarda, & Garola, 2010). Marine ecosystem services generally include Carbon sinking, nutrient recycling, sustaining fishery resources, protection from coastal erosion and assimilation of waste, etc. These are intangible services and excluded from the market values, therefore it is very challenging to monetize their values and yet it is extremely important to make this natural capital comparable with other market based sectors for planning and developing activities and other decision-making processes (Brenner, Jimenez, Sarda, & Garola, 2010). Two basic methods exist to determine the value of the environment, namely direct and indirect methods. The direct method involves with the consumers' willingness to pay for the intangible benefits they may obtain from the environment, and the indirect methods assess the changes of people's behaviors according to the environmental alterations. When it comes to the valuation of the South Asian seas, the related scientific studies are extremely rare. Some studies have been done through regional collaborative bodies such as BOMLME Project, but their geographical scope doesn't cover the entire South Asian seas. Maintaining national databases for the existing marine ecosystems is important since the South Asian countries are in different levels on the paths to Blue economy. They have their own marine policies and different countries may put different prices on the same ecosystems, based on the services they gain from those, and how important they are to the national economies. For example, Maldives may put a higher price on their reef ecosystems than what Bangladesh puts on theirs, because, marine tourism is more important to the Maldives' economy than it is to the Bangladesh economy. These kinds of valuations are important to determine the environmental costs if the particular ecosystem is damaged, thus allow cost-benefit analysis for proper policy implementation

(Remoundou, Koundouri, Kontogianni, Nunes, & Skourtos, 2009). Furthermore, according to Agenda 21 of the 1992 UNCED, economical incentives have to be developed with regard to the marine environment, in order to reduce the environmental degradation and put a price on the degraded resources, thus it can be compensated, once they are damaged (UNCED, 1992).

5.3.3) Social pillar

5.3.3.i) *Blue Economy for the development goals*

The importance of the oceanic environment for the sustainable development of the mankind was acknowledged for the first time, by the 1992 UNCED, with the adaptation of Agenda 21. Chapter 17 of the Agenda 21 has been devoted for the nations' commitments for integrated management of coastal areas, protection of the marine environment, sustainable usage of living resources, uncertainties in marine environmental management and climate change, strengthening regional and international collaborations and development of small islands (UNCED, 1992). This provided the first blue print for the concept of sustainable development, in which the poor nations get options for poverty eradication through the conservation of natural resources. Ten years later, the 2002 World Summit on Sustainable Development (WSSD) further reinvigorated the commitments to sustainable development, by adopting the Johannesburg Plan of Implementation (JPOI), which provides institutional frameworks and implementation for poverty eradication and other development strategies for the SIDS and other nations (Earth Negotiations Bulletin, 2002). With regard to the marine environment, JPOI draws attention to the issues of integrated and ecosystem-based management strategies and several other ocean-related issues with measures to mitigate them, such as declaration of marine protected areas, marine assessments, coordination, ocean financing and capacity building (Cicin-Sain, Balgos, Appiott, Wowk, & Hamon, 2011). The MDGs are about to reach the deadline in 2015 and the South Asian Region is still lagging behind in terms of alleviating poverty and achieving

environmental sustainability, while practicing agriculture as the major industry. Therefore, if it takes a paradigm shift to the Blue economy, it is very important to analyze how the concept may accompany with the development goals.

5.3.3.i.a) *Poverty eradication*

The coastal ecosystem values are the highest of all ecosystem values of the planet (Nellemann, et al., 2009), on which more than 400 million of the coastal population of South Asia directly or indirectly depend on (Miththapala, Sawarkar, Krishnan, & Ariyabandu, 2012). Those may represent a large portion of the poorest in the region and this amount of dependency may adversely impact on the long-term sustainability of the natural resources. Therefore, proper management of the resources is the key to secure their long term utilization, which in return secures the livelihoods and food supply of the poor. Thus, a strong link between the 1st MDG of eradication of extreme poverty and hunger and Blue economy can be developed.

Coastal and marine ecosystems of the South Asian countries are comprised of coral reefs, mangroves, salt marshes, estuaries, lagoons, tidal flats and they provide food, medicine livelihoods and many other intangible benefits to the coastal populations (eg: Table 3). The coastal population is increasing rapidly and the increased consumer pressure on these ecosystems makes them unable to perform their functions.

Country	Area of Mangrove forests (ha)	Economical benefits
	(2000)	
India	479000	<ul style="list-style-type: none"> • Firewood, thatching materials, food, medicine and chemicals • Fishing grounds for fishermen and tourist attractions
Sri Lanka	7600	
Pakistan	176000	
Bangladesh	622600	

Table 4. Mangrove ecosystems of South Asian Countries (The World Bank, 2008)

It is been estimated that, 15% to 70% of household income of the poor people is generated by exploitation of natural environment, and subsistence are more than that (USAID, 2006). Most of the coastal poor obtain their food from fisheries by artisanal fishing and earn income by selling the excess. Firewood is the most common form of fuel, which they easily gather from the nearby mangrove forests. The adverse impact on those natural resources may diminish the benefits for the poor, making them poorer, vulnerable and marginalized (Newton, Cote, Pilling, Jennings, & Dulvey, 2007). Generally, issues such as overexploitation, pollution, habitat degradation and lack of management practices are the key reasons to weaken the healthy relationship between the ecosystem services and poverty eradication. However, not only in the South Asian region, but at the global scale, there is a lack of knowledge and baseline data to determine the relationship between ecosystem services and poverty levels. This restricts the future predictions of the resilience of poverty levels to the environmental changes.

One drawback of the green revolution was the polarization of the poor farmers due to the lack of access to the technological advances. This phenomenon is also true for the aspect of the poverty eradication strategies of the Blue economy. There is no value of any resource, if it remains inaccessible. By holding the ownership or other forms of secure modes of access, natural resources become “natural assets” and poor people without access to natural assets become unable to obtain food and other intended needs, and recover from market shocks and misfortunes (Lee & Neves, 2009). *Access* should be the major *resources* for the poor, because it is the core of the poverty alleviation through the development of sustainable livelihoods based on natural resources (Bebbington, 1999). Moreover, with the lack of proper land ownership, most of the poor tend to live in ecologically vulnerable areas with low productivity (Baumann, 2002) and it further limits the access to natural resources. Climate change, induced mostly by anthropogenic activities, makes the marine ecosystems more vulnerable and in turn, losing opportunities for coastal poor.

5.3.3.i.b) Gender equality

The third MDG is dedicated to promote gender equality and empowering women in the aspects of access to education, work and political engagements. South Asia is well pronounced of gender-based discrimination (Delavande & Zafar, 2013), where women are impoverished and kept away from education, health care, decent work, equitable wages and land ownership. Men and women feel poverty differently and the norms based on gender, cause high poverty incidents among women (Kabeer, 2003). In south Asia, 39% of the agricultural work force is women, yet they are not considered as key stakeholders (IFPRI, 2008). This prevents them from productive resources, market access and other services.

The Blue economy has provisions for women empowerment, where it promotes equal access to marine resources (IFAD, 2014). The simplest, yet the most important approach, is the generation of employment opportunities through small-scale fisheries and aquaculture. Fishing was previously considered as a men's job and only shore-based activities such as post-harvesting practices and marketing were available for women (Kusakabe, 2003). Nowadays, fisher women are common in South Asian countries, who support their families through small scale artisanal fisheries. Also, women in fish farming have been contributing to the national economies for a very long time. However, the current initiatives and policies are not quite favorable for fisherwomen. Countries like India, Bangladesh and Sri Lanka are practicing offshore fisheries with mechanized crafts and gears, which has been a reason for the marginalization of artisanal fish folks, especially women. With the increased fishing efforts, coastal fish catches have declined and artisanal fishermen, including fisher women, are losing their income sources. Regarding aquaculture farming, access to technology has become a major barrier to increase women's contribution. In countries like India and Bangladesh, most of the rural females are illiterate and their socio-cultural conditions prevents them from participating in training and extension programs. Therefore if Blue economy

is to address the gender inequality issues, simply providing subsidies for coastal fisher women would not be enough. The initiatives must be penetrated throughout the society and tackle the root cause of the problems with proper policy implementation.

Other than the fisheries sector, other marine sectors such as tourism and transportation also provide better opportunities for women. There is a growing recognition for women seafarers in the shipping businesses. Most women seafarers are employed in cruise liners and ferries where 1.7% of them are represented by the South Asian and Middle Eastern women (ILO, 2014). Coastal tourism opens up market opportunities for women merchandisers, where they can work and compete with male merchandisers. Other opportunities may range from catering to accommodation. Also, it has been observed that the tourism promotes adult education and reduce illiteracy for women (Jucan & Jucan, 2013). By all these means, proper instruments of Blue Economy will be a strong hand to close the gender gap in the poor the South Asian regions.

5.3.3.i.c) *Environmental sustainability*

South Asia is behind the expected outcomes of environmental sustainability, which is the 7th of the MDG. Inability to achieve this goal is a major reason for almost a quarter of the problems prevailing in developing countries, such as lack of clean drinking water, poor sanitation and pollution (Baumann, 2002), and poverty is unlikely to be ended without environmental sustainability. South Asia is battling with both poverty and environmental degradation, creating the worst possible scenario. Marine ecosystems, such as coral reefs, sea grass beds, mangroves and salt marshes are being degraded due to natural and anthropogenic activities. This is combined with frequent discharges of pollutants, sediments and nutrients, accelerating the degradation process. Mangroves in the Bay of Bengal region are prone to natural disasters such as cyclones and Tsunamis and they are also being cleared off for agriculture, construction of aquaculture ponds and human

inhabitation as well. In Mumbai, India, mangroves of all seven islands have been cleared and reclaimed into one land to build houses and a large delta area in between India and Bangladesh has been cleared off of 150000 ha of mangroves over the past 100 years, for agriculture (Kathiresan, 2008). Coral reefs in the South Asian seas are suffering from high mortality due to temperature-induced bleaching. During 1998 El Niño incident, in Maldives and Sri Lanka, coral bleaching was evident down to 30m to 40m, respectively from the surface, which caused 90% coral mortality and a drastic reduction of the number of reef fish (Rajasuriya, Maniku, Subramanian, & Rubens, 1999). Coral reefs, salt marshes and mangroves are shoreline protectors which absorb the energy from the breaking waves and prevent coastal erosion. When this protection is interrupted by its degradation, the coasts become vulnerable itself, making the inhabitants exposed to environmental risks such as natural disasters.

Incorporating the development policies with national policies to reverse resource degradation is an important target in the MDG 7, which is beneficial for implementation of sustainable coastal development plans, as expected in the Blue economy concept. South Asian countries' national policies give much weight to the agriculture aspects, but poor attention to the coastal resources, unless they are to be exploited.

Even though the eight MDGs are multidimensional and multi-sectoral, a close relationship among them has to be understood, where hunger and poverty eradication is achieved through the path from education, healthcare, gender equality to environmental sustainability, which is supported by International cooperation. MDG 7 is the base, which most other MDGs are standing on, and it secures the stability of the entire system. Most of these development goals can be supplemented by the opportunities of the Blue economy, where it provides poor people with food, income and uplift their living conditions. But the success depends on how sustainable the utilization of coastal and marine resources is.

5.3.3.ii) *Blue economy and the Post 2015 development agenda*

MDG will be expired in 2015, and the world is looking for another set of goals to replace or supplement them. The UN secretary general has been requested to plan a post-2015 development agenda, and Rio+20 conference has initiated an intergovernmental process to come up with a similar plan (Sustainable Development Goals). Both processes are requested to interlink together to design a universal post-2015 development agenda (ECOSOC, 2014). The post-2015 development agenda is proposed to be wider and more inclusive than the MDG. MDG only had a marginal role with respect to the marine environmental aspects (Visbeck, Kronfeld-Goharani, Neumann, Rickels, Schmidt, & van Doorn, 2013). MDG 7 has two oceanic indicators, namely sustainability of fish stocks and declaration of marine protected areas, which both are used as indicators of environmental sustainability. Other than that, there is no clear cut ocean environment related goal to be achieved in the MDG. It has been recognized that poverty can be eradicated only through environmental sustainability (UN, 2013), and a significant consideration has to be paid for the marine environment in the post-2015 development agenda. The agenda is still not set, but worldwide proposals are being forwarded expressing different views. One proposal is to have a dedicated stand-alone goal for the marine environment due to the complex nature of the ocean related issues, and it is to consist of targets for life sustaining and regulatory functions of oceans, healthy and productive environment, coastal community resilience and multi level ocean governance (Visbeck, Kronfeld-Goharani, Neumann, Rickels, Schmidt, & van Doorn, 2013). Importantly, “Blue Economy” is also inscribed within this goal, which is to be achieved through maintaining a healthy ocean environment. There, issues such as reduction of biodiversity, unsustainable fisheries, marine pollution, ocean acidification and conservation of high seas are to be discussed. Another proposal has been made to have the ocean aspects in more than one goal, therefore, the issues can be addressed in a cross cutting manner.

Chapter 6: Challenges for the Blue Economy and levels of ocean governance

6.1) Challenges

SIDS Blue Economy, which is the green economy in marine environment, provides measures to weaken the strong bonds between the socio economical development and environmental degradation and accompanies the real value of the blue capital to the national development. However, the reality is not as crystal clear as it is described in the definitions. The world's marine resources are already being heavily exploited and marine environment is severely disturbed by the anthropogenic activities. Therefore the future of the Blue economy is not very bright if the situation is going to keep up in the same way they do now. The most important thing is to identify the countries' possible opportunities and obstacles to sustain those opportunities. For example, the ship breaking industry is well established in India and Bangladesh, disregard of their environmental and safety concerns. Therefore it should not be established in Sri Lanka. Instead of that, Sri Lanka should sustainably develop its coasts for other industries such as fisheries and tourism. Sri Lankan coasts are not suitable for ship-breaking industry due to the low tidal level fluctuations and the pollution and other impacts will deteriorate the value of the coasts for other sustainable industries. It is very important to identify the limits of the resources, expected economical outcomes and associated environmental costs before irreversible decisions are made. Furthermore, countries should incorporate their national policies to the dimensions of the blue economy, while giving the proper attention to the existing and expected future challenges.

6.1.1) Overexploitation of marine resources

The myth of Oceans being unlimited reservoirs of resources has been changed and records of overexploitation are found from all over the global ocean. Overexploitation is a threat to food security and biodiversity (MEA, 2005) and fisheries resources are mostly affected by overexploitation in marine. When fish

stocks are completely collapsed, it is unlikely that they are going to be restored to the previous levels. In the Western Indian Ocean, most of the fish stocks are fully exploited where 24% of the fish stocks have no room for further expansion and in the Eastern Indian Ocean, all the fish stocks are being overfished due to the uncontrolled open access nature (Freitas, Delagran, Griffin, & Miller, 2008). In the Eastern Indian Ocean, resource degradation is very much related to the population and the high unemployment rate of the coastal states (De Young, 2006). Another reason for over exploitation in this area is poaching, due to the lack of monitoring control and surveillance (Martosubroto, 2005). According to the Trans-boundary Diagnostic Analysis of the BOBLME project, overexploitation of the marine living resources has been identified as one of the three major priorities to be addressed, while others are habitat degradation and pollution (TDA-Volume 1, 2012). The government subsidies on the fisheries in the developing regions, resulting fisheries overcapacity, have been criticized in the events of WSSD 2002 and Rio+20. Government subsidies result in only a marginal profit, but induce fishing efforts and encourage excessive participation in the exploitation, compromising the resource and employment sustainability (Sumaila, Lam, Le Manach, Swartz, & Pauly, 2013).

6.1.2) Pollution and habitat degradation

Coastal pollution is heavily influenced by excessive amounts of Nitrogenous chemicals, which are introduced to the rivers by agriculture. Other than that, untreated sewage may find its way to oceans through river water discharges. All these pollutants may result in eutrophication or dead zones, which are harmful for marine living resources. South Asia is home to number of large rivers and most of them are highly polluted. In India, 18240 million liters of domestic sewages are discharged in to the rivers every day (Miththapala, Sawarkar, Krishnan, & Ariyabandu, 2012). Moreover, poorly maintained aquaculture practices are common in the coastal regions, where the effluents are generally discharged

untreated in to the sea. Heavy metal effluents and oil slicks from pipelines and ship wrecks are also becoming more frequent, damaging coastal habitats such as sea grass beds and coral reefs, and become lethal to associated organisms. Occupied by the busy shipping lines, the Indian Ocean region is threatened by invasive species, discharged along with the ballast water (Michel & Sticklor, 2012). Especially in the high seas, deep sea fisheries resources of the Southern Indian Ocean are being exploited by bottom trawling and significant impacts have been recorded in the forms of fish and coral bycatches (Bensch, Gianni, Gréboval, Sanders, & Hjort, 2009). Unfortunately up-to-date data on the effects of marine pollution on the coastal habitats is rarely available.

6.1.3) Climate change

The South Asian region is already experiencing heavy rains, long droughts, temperature changes and other extreme events, which are signs of climate change. The vulnerability of the region is further enhanced by the high population growth and poverty conditions. Climate change is a critical challenge for developing regions, where the economies basically depend on the exploitation of the natural resources. Environmental hazards in the region, such as land degradation, GHG emission and pollution, may induce climate change, directly or indirectly, which in return, cause negative impacts on natural ecosystems. Climate change is a dual challenge for the tasks of meeting food demand and environmental protection (Cassman, Dobermann, Walters, & Yang, 2003). More prominent climate changes of the South Asian region are associated with increased air temperatures and changes of the annual mean rainfall, and their occurring frequencies have been increased over time (Cruz, et al., 2007) Moreover, In the Bay of Bengal and the Arabian Sea region, the frequency of the cyclonic events, since the 1970's has decreased, but their intensity has been increased, causing much more severe damage, especially to coastal regions of India (Cruz, et al., 2007). Increased sea surface temperature is also evident in the South Asian region, which results in

thermal expansion, followed by sea-level rise. There is 1-3mm per year sea level rise in coastal South Asia, which is slightly higher than the global average and the rate of sea-level rise also has increased, compared to the 20th century (Solomon, et al., 2007). Due to this, lowlands of the coasts are at risk of frequent flooding, for which Maldives is the best example. One third of the mainland of Maldives is slightly above sea level and due to this low elevation, many islands are already suffering from shoreline erosion and coastal flooding. Another impact of the anomalies of the sea surface temperature is the El-Niño, which is one of the reasons for declined fish stocks in the South Asian coastal waters (Cruz, et al., 2007). Moreover, this is the major reason for large-scale coral bleaching there.

As a whole, it is estimated that South Asia will lose 1.8% of GDP by 2050 due to the effects of climate change (Ahmed & Suphachalasai, 2014). It causes inequalities, since the impacts are uneven and disproportionately affect the poor, making them more poor (Stern, 2007). There should be measures to mitigate climate change impacts by means of policies, strategies and adaptations. However, in the South Asian region, proper climate change adaptations are restricted by lack of financial and technical capacity and governance related issues (USAID, 2010).

6.1.4) Issues of maritime security and disputes

The Independent World Commission on the Oceans (IWCO) emphasizes the importance of the maritime security for peaceful uses of the oceans, where the benefits have to be shared by all, under an equitable public order (Rahman, 2009). Maritime security issues have become international concerns and it may surface as military threats (traditional maritime security issues) such as piracy and terrorism, or environmental threats (non-traditional maritime security issues) such as IUU fishing or habitat destruction.

Shipping affairs in the Indian Ocean region are becoming more concentrated due to the shift of the weight of the world economy from North Atlantic to Asia, and

particularly the interest over the resources in the Indian Ocean seabed is increasing (Rumley, 2013). Together with this trend, there has been an upsurge of the terrorist attacks. South Asia is a hub of terrorist attacks, where many cross-border terrorist groups are in operation. The most effective group of terrorists was the Liberation Tigers of Tamil Eelam (LTTE), saturated in the Northern and Northeastern parts of Sri Lanka and had formed their own naval squadron called “Sea Tigers” (Acharya & Withana, 2008). They are accused of attacking several Sri Lankan battleships and hijacking several merchant ships, and they had succeeded in drug trafficking and arm smuggling with their own fleet, registered under flag of convenience with concealed identity (Ghosh, 2004). However, in 2008, the LTTE was completely eliminated, which significantly reduced security threats in South Asia. Furthermore, incidents such as terrorist groups using sealed containers to cross borders, and gunrunning have been recorded in ports of Pakistan and Bangladesh (Ghosh, 2004).

The region is at environmental risks associated with possible oil and chemical spills, due to the increased maritime traffic, which the impacts could be significant and long term. Another major problem is IUU fishing, generally taken place out of states’ national jurisdiction. The most common example in the South Asian region is the illegal fishing activities undertaken by the Indian fishermen in Sri Lankan maritime zones and vice versa, which eventually degrades the marine living resources. Fishermen of both sides, accused of illegal poaching, get arrested very frequently, resulting conflicts with the neighborliness of the two countries.

Other than the nontraditional maritime security issues, disputes and rivalries among nations may derive situations which hinder the sustainable development of the region. Geopolitical rivalries between states can dampen the future peace and the willingness for regional cooperation, which is a restriction for sustainable development. India has territorial boundary related and political disputes with china while Pakistan has a continuous rivalry with India over territorial

boundaries, in which India is irritated by China being supporting Pakistan (Sweijts, Cleven, Levi, Tabak, Speear, & de Jonge, 2010). Bangladesh recently settled a 40 year old maritime boundary dispute over India peacefully, but it is not possible every time, as in the case of the maritime boundary dispute between Bangladesh and Myanmar, where Bangladesh called for suspension of the hydrocarbon explorations of Myanmar, otherwise threatening to use of force (Balaram, 2012).

6.2) South Asian perspectives for good ocean governance

Facing all these issues and much more to come in the future, South Asia is demanding solutions and action plans, if it is to promote the Blue Economy. Above evidence indicates that, factors of environmental degradation and climate change are all interconnected, and put a cumulative detrimental effect on the coastal ecosystems. Effective remedies are needed in terms of management plans and collaborative approaches to tackle the problems and replace the causes with sustainable means. Apart from national and regional initiatives, there are a number of international organizations in the region including FAO, IUCN and UNEP, who are actively involved in marine management programs, which are focused on the areas of planning, livelihood empowerment, awareness, capacity building and governance, to strategically address marine environmental issues.

6.2.1) National-level initiatives

6.2.1.i) *Legal instruments*

Table 5 shows some of the municipal legal instruments to protect the marine environment from pollution. However, process of the environmental law implementation in South Asia remains challenging, due to the practical issues such as poorly executed EIA, lack of technical and financial resources, corruption, lack of coordination between authorities and conflicting interests (Gawel, 2013).

Country	Instrument	Remarks
Bangladesh	The Constitution of Bangladesh, 1972	Protect and improve the natural environment while safeguarding them for present and future citizens
	The Territorial Water and Maritime Zones Act 1974	Establishment of conservation zones, pollution control
	Marine Fisheries Ordinance of 1983	Banning of illegal fishing methods, special protection for aquatic flora and fauna.
	Coast Guard Act 1994	Overall protection of the coasts
	Port related laws	Prevent vessel source pollution
	Ship Breaking and Recycling Rules, 2011	Compliance of environmental measures for hazardous wastes
India	The Constitution of India	Protection and the safeguard of the natural environment
	Coast Guard Act, 1950	Penalties for port water pollution
	The Merchant Shipping Act 1958	Prevention of pollution from ships in the EEZ
	The Water (Prevention and Control of Pollution) Act (1974)	Prevent pollution from land based sources
	Maritime Zones Act, 1976	Prevent pollution in the EEZ and continental shelf
	Environment Protection Act (EPA) 1986	Activities permitted in the coastal zone
Maldives	The Constitution of Maldives	Protect the environment and its benefits
	Environmental Protection and Preservation Act	Prohibits all forms of environmental pollutants
	Armed Forces Act, 2008	Protection of the maritime zones

Pakistan	Environmental Protection Act, 1997	Protection and conservation of the environment from pollutants and other hazardous substances
	Maritime Security Agency Act, 1994	Prevent pollution and other disasters in the maritime zones and protect the quality of marine life
	Pakistan Merchant Shipping Ordinance, 2001	Banning of sewage and garbage discharges
	Ports Act, 1908	Banning of ballast water discharge and rubbish in to ports
	The Territorial Waters and Maritime Zones Act, 1976	Implementation of rules on pollution prevention
Sri Lanka	Marine Pollution Prevention Act	Domestic and international legal obligations for marine pollution prevention
	National Environmental Act 1980	Prevention of marine pollution
	The Fisheries and Aquatic Resources Act	Protection of fishery resources, banning of poisons and explosives for fishing
	The Coast Conservation Act	Preservation and conservation of coasts, coastal zone management plan
	Ports Authority Act, 1979	Pollution prevention in harbors and ports

Table 5. Legal instruments to discourage marine pollution in the South Asian countries (Arif & Karim, 2013)

6.2.1.ii) *Integrated Coastal Zone Management (ICZM)*

Integrated Coastal Zone Management is a concept, where it considers the management of multiple usages of the coastal resources, while acknowledging their interrelationship with the natural environment. Previously remained Coastal Zone Management (CZM) programs in the developed countries were introduced with the term “Integrated”, when it was realized that a cross-sectoral approach is required for effective CZM (Ibrahim & Hegazy, 2013). The integrated approach made it a comprehensive process with considerations of all the components of the marine sector, with links to the coastal zone, coastal communities and the national economy. Both ethical and economical benefits are expected from ICZM, with ethical benefits being sustainable development and social equity, while obtaining economic benefits, compared to the separate sector-wise management (Cummins, Mahony, & Connolly, 2004). The ICZM process came to the developing regions in 1990s, but many developing countries have failed to achieve proper ICZM implementations (Ibrahim & Hegazy, 2013).

There are certain principles to be included in a typical ICZM plan (Isager, 2008).

- Vertical and horizontal integration among authorities;
- Stepwise projects;
- Public stakeholder participation; and
- Capacity building and adaptive learning

But when it comes to the developing regions such as South Asia, all these practices together, are rarely practiced. The processes are generally limited by poor financial allocations, governance issues, lack of coordination and lack of evaluation capacity. Successful coastal management plans need technical, management and institutional capabilities (Haq, 1997), which the developing countries lack the most.

Country	Challenges	ICZM process	Drawbacks
Bangladesh	Climate change and shoreline vulnerability	Coastal Zone policy, Coastal development strategy, priority investment program, Community capacity to enhance livelihoods, Enabling institutional environment, Integrated knowledge base.	Knowledge gaps, lack of coordination, lack of policy harmonization, governance issues, fragility of political support.
Maldives	Coastal erosion, climate change, reduction of fisheries, pollution, user conflicts,	Community based management (earlier), co-management, conservation and protection, alternative livelihoods.	Lack of awareness, Weak implementation and enforcements, duplication of responsibilities, lack of political will and trained personnel.
Sri Lanka	Coastal erosion, habitat degradation, pollution, declining of coastal fisheries,	Land use planning, direct development, regulations, shoreline exclusion, special area planning, EIA, awareness, policy and guideline development, research, coordination and monitoring.	Governance issues including lack of implementing capacity, lack of coordination among authorities
India	Over fishing, pollution	Technology and capacity building, fisher welfare, marine fisheries schemes and management systems, awareness and training,	Lack of communication, rivalries, lack of infrastructure, human and financial resources, lack of skills.
Pakistan	No dedicated ICZM plan. Activities in the coastal zone are regulated by various national environmental regulations.		

Table 6. ICZM strategies in South Asian Countries (Islam, Zhi Xue, & Rahman, 2009; BOBLME, 2010; CSE, 2014)

6.2.1.iii) *Management of Protected Areas (PA)*

The principles of PA have been practiced as fisheries management tools by the communities in the region for thousands of years, but the scientific concepts of PA are relatively new (IUCN, 2008). Components of PA such as Marine and Coastal Protected Areas (MCPA) have been defined by international organizations such as IUCN and AHTEG, in which their common descriptive elements call for the reservation of space by law or customs for protection of its enclosed environment. Objectives of PA may include initiatives for resource development, data collection, environmental standardization and improved international understanding, and there are several categories of PA, based on the management objectives of each country (IUCN, 2008).

Countries have declared national PA and, formed policies and legislations, which usually reflect their international obligations to protect and manage them. Declaration of MCPA is very effective in ICZM process, where the ecological, economical and social linkages between MCPA and ICZM identify and mitigate the impacts of the uncontrolled activities in the surrounding areas of MCPA (Cicin-Saina & Belfiore, 2005). There is no particular regional plan for the management of MCPA in South Asia, other than the national policies and legislations. There are several drawbacks regarding the management of MCPA in the region. They are ecologically underrepresented, since the declarations have been made long before the scientific concept of PA is properly understood (Perera, 2005). Some critical areas are still not declared as PA due to the shortcoming of data collection and institutional capacities (UNEP-WCMC, 2008).

There can be trans-boundary MCPA, where the space extends beyond the national jurisdictions of one country. In South Asia, few trans-boundary MCPA are there such as “The Sundarbans”, shared by Bangladesh and India, and Runn of Kutch-Kachch Desert, shared by India and Pakistan, but the cooperation of these countries for shared management goals is very little (IUCN, 2008). MCPA may be

declared international status, such as “World heritage” (WH) sites, once a country become party to certain international agreements, which makes them eligible to nominate their national PA to obtain international status. This kind of action is very important for developing regions, since international status attracts funds from international conservation programs. In South Asia, only two of such PA exist, namely Sundarbans sanctuary of Bangladesh and Sundarbans National park of India, with several other potential WH sites including Trincomalee Bay of Sri Lanka and the Atoll systems of Maldives (IUCN, 2008). Despite of all the efforts, UN has ranked South Asia at the lowest in the world, in terms of declaration of MCPA (Chape, Blyth, Fish, Fox, & Spald, 2003).

6.2.2) Regional-level collaboration

Collaboration and cooperation are complimented by sustainable development agendas such as Agenda 21 and JPoI. UNCLOS requires nations to take all possible cooperative measures to ensure the protection of the marine environment. Issues such as pollution and climate change have become international concerns, since the impacts may reach national jurisdictions of more than one state, therefore best handled at regional level.

South Asian marine environment management is being considered at few regional programs, under the auspicious of organizations such as UNEP, FAO and SARCC. Regional actions are much sustained and cost effective especially in the developing countries, because they can immediately adapt to regional action plans, which do not require technologically advanced systems as in global level actions (Boczek, 1984).

6.2.2.i) *UNEP regional seas program-South Asian Seas Region*

The regional seas program was launched by UNEP in 1974, with goals of addressing the issues of marine and coastal environmental degradation by sustainable management and utilization practices, with the collaboration of

neighboring countries (UNEP, 2014). The program core is to prepare a regional action plan with legal obligations (regional convention), and it is prepared according to the prevailing environmental challenges in the shared space of the region (UNEP, 2014). The South Asian Seas Action Plan (SASAP) in this regard, has been adopted in 1995, with four priorities, namely, ICZM, oil spill contingency planning, human resource development and impacts from land based activities (SACEP, 2014). The SASAP is implemented by the South Asian Cooperative Environment Program (SACEP), and it doesn't follow any regional convention that is legally binding, but international conventions including the UNCLOS. India, Pakistan, Bangladesh, Maldives and Sri Lanka are participating in the program. However, most initiatives have been proved to be unsuccessful due to the lack of attention from the heads of the governments, slow development and progression of mitigating activities and lack of intellectual approach (Karim, 2008).

6.2.2.ii) *South Asia Coral Reef Task Force (SACRTF)*

The SACRTF has been funded by the EU as an initiative to coordinate the national level management practices of reef and coastal ecosystems with regional level, to promote collaborative actions and trans-boundary response to overcome regional environmental challenges with sufficient political commitments. It was launched in 2007 with the participation of all the five coastal states of South Asia. The priorities include management of MPA, regional data management and sharing, regional cooperation for marine resource management and strengthening the policy making capabilities in livelihood enhancement.

6.2.2.iii) *Bay of Bengal Large Marine Ecosystem (BOBLME) Program*

The BOBLME, one of the sixty four (64) global LME programs, has been implemented by the FAO in 2009, with the aids of several other international organizations and participating governments to diagnose the trans-boundary

marine environmental issues and prepare a regional proactive Strategic Action Plan (SAP). Three priorities have been identified namely, overexploitation, habitat degradation and pollution, and stepwise procedures are implemented to coordinate annual national and regional work plans to prepare the final SAP. Except for Pakistan, other four coastal South Asian countries with few Southeast Asian countries are participating in the program. Even though, the project has discovered success, several country-wise governance issues and deficiencies are still hindering its regional performances.

6.2.2.iv) South Asian Association for Regional Cooperation (SAARC)

Seven (7) South Asian countries established SAARC in 1985 to formulate collaborative approaches to develop economic, social, and cultural welfare in the region. Even though “Environment” has been an area of cooperation, not significant attention has been paid to the marine environmental aspects. However, SAARC secretariat has established a focal institution, SAARC Coastal Zone Management Centre (CZMC) to promote the regional collaboration for better management of the coastal zones and develop the regional awareness (SAARC CZMC, 2013). The institutional capacity of this has been further strengthened by the Dhaka Declaration at 13th SAARC summit (SAARC, 2009).

6.2.2.v) Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)

India, Bangladesh and Sri Lanka together with few other South Asian and Southeast Asian countries are involved in BIMSTEC, a sub regional group to work on number of priority areas including marine environmental aspects. During the third BIMSTEC summit in 2014, the member states have agreed to cooperate in fisheries management, sustainable utilization of marine resources, environmental protection, and disaster management (BIMSTEC, 2014)

6.2.2.vi) *Indian Ocean Tuna Commission (IOTC)*

India, Pakistan and Sri Lanka are members of the IOTC, an intergovernmental organization, established for the conservation of Tuna and Tuna like fish in the Indian Ocean to encourage the sustainable utilization of regional living resources. IOTC functions include gathering of population and catch and effort data, encouraging research, adopting scientific conservation methods, and reviewing socioeconomics of fisheries (FAO, 2014). The performance of the initiatives is annually reviewed by the commission, in terms of operational and legal structure to identify the weaknesses, and potential solutions are suggested. The recent review revealed that the current IOTC agreement is outdated and not suitable for modern fisheries management, therefore, new amendments or replacements are recommended (IOTC, 2009)

6.2.3) International-level initiatives

South Asian countries have ratified number of international treaties on the protection and conservation of marine environment. Table 7 and 8 briefly discusses some of those treaties and voluntary instruments without any particular order. Treaties become legally bound, once they are ratified by the states and states are obliged to refrain from the actions that defeat the treaty objectives (Vienna Convention Article 18, 1969). However, the ratifications are not automatically enforceable, and the applicable domestic laws have to be enacted before the treaties become enforced (Arif & Karim, 2013). Therefore, strong political will is the key for the states to be adhered to the commitments of the treaties. At the same time, uniform ratification of international agreements in the region is very important to close the loopholes and promote the regional good ocean governance. Table 7 and 8 show such kind of regulatory gaps remaining, which may hinder the regional performance of regulating marine pollution and conservation of marine environment.

Country	UNCLOS	International Agreements on marine pollution										
		MARPOL (73/78)						CLC (92)	HNS (96)	OPRC (90)	Dumping (72)	Intervention (69)
		I	II	III	IV	V	VI					
India	√	√	√	√	√	√	√		√		√	
Bangladesh	√	√	√	√	√	√			√		√	
Pakistan	√	√	√	√	√	√	√		√	√	√	
Sri Lanka	√	√	√	√	√		√				√	
Maldives	√	√	√			√	√					

Table 7. Status of ratification of marine pollution related agreements (IMO, 2014)

Country	International Agreements							
	Species and habitat conservation						Climate change	
	UN FS (95)	FAO CCRF (95)	CBD	WH	CMS	Ramsar	UNFCC	KP
India	√	√	√	√	√	√	√	
Bangladesh		√	√		√	√	√	
Pakistan		√	√	√	√	√	√	
Sri Lanka	√	√	√		√	√	√	
Maldives	√	√	√				√	√

Table 8. Status of ratification of conservation and climate change related agreements (FAO, 2014; CBD, 2014; UNESCO, 2014; CMS, 2013; Ramsar 2014)

Chapter 7: Greening the Blue economy

At Rio+20 conference, the concept of the “Green Economy” was envisioned to promote low carbon, resource efficient and indiscriminative economies to improve human wellbeing and equity, while reducing the adverse environmental impacts and scarcities. While most of the countries agreed on the concept, the Pacific SIDS came up with the concept of the Blue Economy, emphasizing the importance of the oceans to their economies and its interdependency with healthy ocean environments. The outcome document of the Rio+20, “The future we want” has a dedicated section for oceans and Seas, where it has been recognized the essentiality of ecosystem-based management and precautionary approaches to preserve the ecosystem values. With that initiative, the global interest on the topic is being increased and many coastal states are very keen to expand their maritime territories, to claim maximum possible marine resources.

Decoupling of the economic development and the environmental degradation is the key concept of sustainable development, which is very challenging in the marine environment. The oceanic profit-making opportunities and ecosystem values are closely interrelated such that a choice between optimization and maximization has to be made in terms of resource exploitation. The Blue economy is all about implementing the Green Economy strategies in the marine environment. Therefore, it is important to study how the world is getting ready to introduce the perspectives of low Carbon, resource efficiency, zero waste and social inclusiveness to the blue world. Furthermore, policy formulations, public and private expenditures and rules and regulations are involved to redevelop the natural capital to make public benefits (UNEP, 2011).

7.1) Invest in Clean energy

The most important and critical challenge is to limit the “brown economy”, where economic development is based on burning of fossil fuel. Carbon-based fossil fuel

are environmental hazards, resulting in increased CO₂ concentrations in the atmosphere, which is the main reason for global warming, ocean acidification and climate change. Most of the modern commercial fishing vessels use fossil fuel and it is estimated that for many types of fisheries, the output nutritional value is lower than the energy input (Tyedmers, 2004). Combustion of fossil fuel is also associated with fish processing, packaging, transportation and storage. Presence of onboard freezers and winches further increase the fuel demand, and heavy dependency on fossil fuel makes the industries vulnerable to fluctuations of global oil price. However, the absolute contribution of the commercial fisheries to the Global GHG emission is relatively low (Tyedmers & Parker, 2012). Switching from capture fisheries to aquaculture, not only supplements restoration of depleting fish stocks, but also drastically reduces fuel consumption. Ocean-going ships are responsible for more than 3% of the global CO₂ emissions (Harrould-Kolieb, 2008), and without aggressive regulations, it is expected to increase up to 150%-250% of the value of 2007 in 2050 due to the increasing shipping demand (Shi, 2014). Recent discussions on investments in clean energy are common, especially in the shipping sector. The technology for renewable energy is getting advanced, and associated costs are getting lower. Global investment in renewable energy has been increased from \$180 billion in 2008 to \$243 billion in 2011, especially by the Non-OECD countries and fossil fuel consumption is expected to be reduced by 41% in 2050 (UNEP, 2011). Renewable energy is also a solution for the social inequity, where billions of people are still inaccessible to the electricity.

Renewable energy consumption in the marine sector is well tested and documented in shipping and logistics. In order to increase fuel efficiency, integrated technologies of naval architecture, engineering and operational methods, such as hull optimization and slow steaming, are put together. Solar and wind power have been tested as sources of renewable energy, but the amount of energy generated, is inadequate for full-sail propulsion (RAEng, 2013). Other sources such as bio-fuel and Liquefied Natural Gas (LNG), are being considered, while usage of gas

turbines, fuel cells, batteries and Hydrogen as a fuel, are about to be promoted in the future.

7.2) Invest in Innovations

Frontier, adaptive and absorptive innovations are very important in green growth. Frontier innovations are new ideas, which are still in the research level, and adaptive innovations are being used to further develop the existing technology. Absorptive innovations are capable of changing the existing technology by learning from previous types of innovations. The marine sector is very prone to innovations in terms of resource efficiency. In the ecosystem-based management approach, innovations may influence people to use technological advances to be engaged in green jobs (de Mallorca, 2007). There is a significant availability of the innovations, especially in the Aquaculture industries for yield enhancement, disease prevention, brood-stock improvement, feed production, hatchery and grow-out technologies and water quality management (Subasinghe, Curry, McGladdery, & Bartley, 2003). Biotechnological innovations are involved in production enhancements, feed and disease management and physical innovations such as changes of cage designs, and strategic innovations are being widely practiced. For example, shifting the location of Atlantic salmon culture from near-shore areas to offshore areas, has improved the ecological and aesthetic value of the beach, while providing high water exchange, and stable salinity to the culture (Subasinghe, Curry, McGladdery, & Bartley, 2003). Furthermore, innovations in marine algae culture are widely gaining popularity. Algae culture is an effective solution as a raw material for the increasing demand of food, livestock feed and bio fuel. Other than that, they are used to manufacture additives, cosmetics and pharmaceuticals. Microalgae have a biomass reproductive capacity of 10-20 times more than that of any terrestrial crop and for marine microalgae culture, no fresh water or fossil fuel is needed. DIAFORCE™ platform is an innovative ecosystem

based system to inoculate and reproduce “diatoms”, a type of microalgae, which is highly nutritious, rich in fatty acids and energy (Vanhoutte, 2009).

Technological innovations are highly demanded in the shipping, ports and logistics sectors. With all the evidences of climate change and environmental pollution, shipping companies are upgrading their services with innovative technologies to reduce environmental costs. Above mentioned energy alternatives are examples of the new innovations and countless simple and advanced innovative technologies are being introduced frequently, to enhance environmental and passenger safety.

Innovations are being readily infiltrated into the tourism sector as well. Most of the innovations in the tourism sector are non technological, such as marketing, organization and training to enhance the productivity of the businesses. Innovations to enhance environmental sustainability open up new business and employment opportunities and environmental benefits of which, “OECD/Nordic Innovation project” is an example (OECD, 2012). The intention of the project is to guide the tourism companies on how to adopt green business models.

7.3) Implementation of Regulations and standards

Another way of enabling the green paths of the Blue Economy is the implementation of national and international regulations and standards. The Rio declaration and Agenda 21 have emphasized the importance of legal and institutional frameworks for sustainable development (Rose, 2011). Regulations are important to merge the responsibilities of different stakeholders, strengthen funding and institutional arrangements, promote incentives of the low Carbon technologies, and recognize the policy requirements and revisions for resource efficiency (UNEP, 2014). Regulatory measures induce the collective behavioral changes of the public towards the environmental friendly investments, biodiversity conservation, and remove barriers such as taxes and subsidies.

When it comes to the marine sector, environmental impacts such as pollution and GHG emissions are subjected to a number of regulations, especially in the shipping sector. Due to the international nature of shipping, most regulations and standards are set at the international level (by IMO) and uniform global compliance has to be ensured. International conventions such as MARPOL, Dumping, OPRC, Antifouling and ship recycling have been entered into force while BWM convention is still to be ratified. All these conventions ensure the protection of the marine environment from many possible sources, by requiring flag, port and coastal states to comply with the standards and regulations. However, the ratification and national level implementation depend on the political will and the institutional capacity of the individual countries. The fisheries sector is also regulated by numerous regulatory instruments in the forms of monitoring, control and surveillance, which are managed by national and regional frameworks, or international instruments such as FAO-administrated regulations and UNCLOS. These instruments can be legally binding or voluntary.

“Blue flag beach certification program” is a method of standardization of beaches and marinas, according to their management levels, water quality, environmental safety and education (Blue Flag, 2014). This is implemented mainly in the EU, Africa, the Caribbean, South America and Canada. These kinds of certification programs are required in the South Asian region also.

7.4) Marine Spatial Planning (MSP)

MSP is a practical tool to plan and manage the conflicting ocean uses and their interactions, to balance the industrial demands of the marine space, with the means of environmental conservation to fulfill the socio-economical goals (Ehler & Douvère, 2009). MSP can be characterized as ecosystem based, place/area based, integrated, adaptive, strategic and participatory (UNESCO IOC, 2014), which the mechanisms reduce cross sector conflicts, enables proactive decision making and safeguard the valuable ecosystem services. Effective MSP approaches consists of

numerous elements, namely problem identification, finance, pre-planning, stakeholder participation, analysis of existing and future conditions, plan approval, implementation and enforcement, monitoring, evaluation and adopting (UNESCO IOC, 2014). MSP approaches run long term with continuous learning and adaptations, which makes the process more dynamic.

Outcomes of MSP generate a comprehensive spatial management plan, usually by the means of zoning maps and sets up political priorities. Sector-wise decisions have to be made with reference to this output management plan and allocation of human activities might have to be managed by other possible means. For example, community based fisheries management can be introduced for coastal fishing zones and ecosystem based management can be introduced for potentially vulnerable areas for natural disasters and climate change (Sensitive areas).

7.5) Identification of Societal roles

Together with all above transformations, sustainable blue economy should identify the societal dimensions and create opportunities to close the inequality gaps. It is obvious that the current economic models are unable to recognize this properly, otherwise the persisting poverty and environmental impacts would not be this much significant. When dealing with the social requirements of the Blue Economy, it is important to question what groups would be impacted by the concept and what priorities should be addressed in the policies. The policy formulations should be concentrated in creating decent employments, biodiversity protection, gender indiscrimination, safety and health of the workers and coastal communities and protecting human rights. Meanwhile, management of the human impact on the blue environment is very important to secure its long lasting socio-economical benefits. For the developing regions such as South Asia, the societal roles of the development models should revolve around poverty alleviation and environmental protection. The greening process is unsuccessful even though all

other investments are being made but the policy formulations based on social justice and equity are inadequate (Pop, Dina, & Martin, 2011).

Opening up of new opportunities in the Blue economy expands the labor market. Fisheries alone provide huge amount of job opportunities for coastal populations, and it is estimated that 260 million people in the world are directly or indirectly involved in marine fisheries related fulltime or part time jobs (Teh & Sumaila, 2013). Public policies that target green transitions may require innovative technologies and skilled labor to facilitate it, which expands and diversifies the labor market. India has invested in research to introduce remote sensing and GIS technology to detect potential fishing grounds, which increases the catch per unit effort and decrease the fuel consumption (Rao & George, 2013). This is a creative approach where fishing creates job market for GIS technologists.

It is very important for public policies to identify the rights of present and future generations who are currently, and about to be utilizing the resources. Integration of human rights and environmental protection is open for discussion at global forums, and human rights is a cross sectorial task to be considered in all issues (UN human rights, 2014). Human wellbeing requirements include healthy food, clean air, decent jobs, recreation, and safety from environment hazards and all these aspects are directly related to the environmental wellbeing. It is obvious that the environmental degradation is closely related to violation of human rights. Also, in the framework of sustainable development, people have the right to participate in decision making at the relevant level, access to information including environmental hazards and be exposed to public awareness (UNEP, 2012). Furthermore, the Rio declaration of the UNCED recognized the “right to development” and stressed out the fact that environmental protection cannot be isolated from the process of sustainable development. Therefore it is important to include the human rights in environmental perspectives in the national constitution and legislations to legally discourage the environmental degradation. As examples,

in 2005, French constitution was amended to include the right of the citizens to live in a balanced environment, favorable for healthy life, and 1980 Chilean constitution has provisions for “right to live in an environment, free of contamination” (UNEP, 2012). In all those cases, the governments become the guardians of the environment and have to make sure that those rights are not violated.

The role of “Cooperate Social Responsibilities” (CSR) has been renewed together with the sustainability concept. In the absence of a universal definition, CSR is simply interpreted as the business contribution to sustainable development (Hugé & Waas, 2011). In enterprises and companies, CSR concept develops business models with ethical behaviors and norms to generate profits and improve the welfare of the employees at the same time. In the maritime domain, CSR is very much familiar in shipping. For example, customer costs have been reduced by the economies of scale and environmental impacts are being reduced through the implementation of international regulations and standards. Importantly, the safety of the seafarers has been secured more than ever, through the implementation of safety codes and regulations on the training requirements. Likewise, CSR can be popularized in other maritime sectors. CSR should come up with the characteristics of respect for mankind and nature, multiple objectives, creation of values, responsibility and voluntariness (Hugé & Waas, 2011). CSR is a win-win approach which reduces negative externalities of the businesses such as pollution and environmental degradation while uplifting the business’s reputation and trustworthiness. CSR’s contribution for sustainability and competitiveness is very significant and it is included as a part of the 2020 Europe strategy (Pop, Dina, & Martin, 2011).

Summary:

South Asia's performance towards development, as interpreted by numerous socioeconomic indicators, is unsatisfactory, despite the fact that the regional economic growth rate experiences a fast increment. The major reason for this is the expanding population, and even fast economic growth rate is unable to significantly contribute to poverty reduction, when absolute number of poor people in the region is still increasing. The poverty status in the region is further influenced by social discriminations and inequalities, political instability and natural disaster, making poverty reduction more challenging.

South Asia is still lagging behind in achieving three major targets of the MDG, namely, poverty eradication, combating hunger and environment sustainability. Achieving the 1st MDG, which is about eradicating poverty and hunger, itself makes way to achieve most of the other development goals. However, it is unlikely that South Asia will meet those desired targets before the 2015 deadline. Therefore, it is obvious that strategies of combating poverty are quite inadequate or not functioning properly.

Agriculture development is the most practical and effective strategy of poverty eradication as it provides food and income sources for the poor. In South Asia, majority of the people are still living in rural areas, where they practice agriculture as the main livelihood. In order to reduce poverty, increase opportunities and empower rural poor, agriculture expansion is widely practiced, and the outputs are expected to be supplementing pro-poor growth. Among numerous milestones of the agricultural development, "Green Revolution" was the most significant event, which increased the regional food production, income levels of the farmers, and saved millions of poor from possible famine.

The Green Revolution succeeded in enhancing the food production in South Asia, with the usage of HYV, fertilizers, pesticides and irrigation techniques. It

increased the opportunities of income generation and people's purchasing power, allowing them to buy nutritious food, thus increased the daily protein and calorie intake. Government spending on agriculture R&D remarkably increased the outputs that uplifted the national economy. However, Green Revolution failed in achieving the true socioeconomic development and its impacts on the natural environment is highly criticized.

Green Revolution caused poor farmers, who are unable to afford new technologies, to become further marginalized. The Environmental wellbeing was severely compromised by intensive usage of fertilizers, pesticides and irrigation, which caused land degradation, pollution, water scarcity and reduced biodiversity. Intensive agriculture seems not to be the best solution to facilitate an increasingly growing population, which forms an ecologically threatened environment to live in. Importantly, future of the agriculture expansion is not certain, since the arable lands in South Asia are limited. Therefore, time has come to shift to or coexist with a different paradigm, which can create opportunities for people and secure the environmental wellbeing.

Rio+20 conferences reassessed the global commitments to Sustainable Development and introduced the term "Green Economy" to eradicate poverty and achieve socio-economic and environmental sustainability. The Green Economy concept compliments low Carbon technologies, resource efficiency and social inclusiveness and discourages environmental risks in economic development. While most of the nations praised the Green Economy concept and expressed the willingness to immediately adapt it, the Pacific Small Island Developing States came up with the "Blue Economy" concept, explaining that they have to adopt the Green Economy strategies with regard to the marine environment, since their economies greatly depend on oceanic resources. Blue Economy concept considers oceans as development spaces and requires measures to weaken the strong bond between the economic development and the environmental costs. It promotes the

value of the blue capital, which should be considered as the natural assets of the resource users. Blue Economy is expected to be keeping up with the sustainability concept, which it requires equity and fairness for the poor, long term environmental protection and balance of the three pillars of sustainability. Moreover, Blue Economy actively involves with the targets of the development goals with regard to poverty eradication, gender equality and environmental sustainability.

Disregard the fact that the Blue Economy concept is gaining worldwide popularity, the world oceans are at risk of overexploitation, pollution and habitat degradation, climate change and maritime security issues. Those issues have to be settled through national ocean governance measures and regional and international cooperation and collaboration. Greening techniques for the Blue Economy is very important, since otherwise the outcomes will not be much different from that of the Green Revolution.

Conclusion:

The intensive agriculture practices in the South Asian region have severely degraded the environment, but in order to feed a growing population, it has to be further intensified, compromising the environmental sustainability. Most of the South Asian countries have significant maritime territories with universally owned high-seas, therefore, opportunities for socio-economic benefits are enormous, thus makes it convenient to adopt blue economy strategies. The region is rich with marine living and non living resources, and its geographic position makes it more strategic in maritime transportation, which further expands the opportunities for nations' development. However, the true potentiality of the Blue Economy opportunities, have not yet been clearly identified by the South Asian Nations. The policies related to blue capital is not very strong as they are of agriculture or other terrestrial industries.

Compared to other countries, island nations are performing better in the South Asian region. Even without practicing systematic Blue Economy strategies to the optimum potential, the socio-economic status of Maldives and Sri Lanka are relatively higher than that of their neighboring states (chapter 1). These levels can be further upgraded by expanding their Blue Economy interests in a sustainable way. Lack of intellectual attention is a major obstacle, and limited socio-economic and environmental data on ocean sector makes it difficult to formulate policies that promote the true value of the blue capital.

There is a huge diversity of socio-economical, political and cultural aspects among South Asian countries, and their national priorities may be different. However poverty is the one common issue that they all suffer from, therefore solutions must be found as a region. Political rivalries and disputes among neighbors restrict the regional development, and the governments have to recognize the importance of cooperation and collaboration on their way to sustainable development. It is necessary to find solutions for climate change as a region through adaptive measures. Issues such as climate change and pollution cannot be addressed alone, due to their trans-boundary nature, and countries have to identify their national, regional and international level roles to protect the natural environment.

Education and awareness also play a major role in changing people's attitudes. Many poor South Asians are illiterate and uneducated, especially women, who live on subsidies that negatively affect on the environmental sustainability. They may have never heard of the sustainability concept, and it won't be realistic if the majority remains unaware of the concept. National, regional and international humanitarian organizations have a role to play in this sense, to empower them with up-to-date education and awareness. A reason for most of the socio-economic issues in the region is the high population. Therefore, people have to be educated about family planning.

One constrain is that the Blue Economy might not be accessible for rural poor, who live in geographically disadvantageous regions, that are far from the coastal regions. In that case, governments have to formulate policies to establish them in the coastal region, to make the resources accessible. However, this may increase the pressure on the natural resources and eventually deplete them. Therefore, this has to be monitored carefully.

At some level, Blue Economy concept may sound costly and South Asian countries may still not be developed enough or wealthy, to practice all the greening techniques. South Asia is suffering from both poverty and environmental degradation, which is very critical, and sustainability might not be realistic when there is an impatient need of poverty eradication. At this point again, it needs to emphasize that political will can make a huge difference. Technology and funding can be obtained through regional and international level collaboration, but most of all, nations itself should develop their willingness. Most South Asian governments are severely corrupted, without proper institutional capacity to implement effective measures. Until these governance issues are solved, South Asia will continue to remain as one of the poorest regions in the world.

Recommendations:

Most important thing is, to directly incorporate Blue Economy concept with the pro-poor growth strategies, especially in the island nations, where the natural resources are to be considered as assets of the poor. With more quantitative research, it is necessary to formulate marine sector-wise national databases, as proposed in this study, in which the evidence-based decisions can be made upon. It will elaborate how the sectors are performing and what measures to be taken in the future. As in agriculture sector, ocean based industries' GDP shares have to be compiled in to one category to evaluate the cumulative value of the blue capital. Nations should consider, gathering all industrial and environmental affairs with regard to marine environment, under one multidisciplinary authority, since it will

minimize the governing, institutional and coordination issues. National policies have to be upgraded, in order to include the value of the blue capital, and accompany with people's rights to live in a safe and secured environment. The processes of the high seas are poorly observed in the South Asian region and a collaborative approach can be practiced in managing activities and conducting research in the high seas, as it is universally owned.

List of References

- (2004). “*Sri Lanka: Reshaping Economic Geography*”. World Bank.
- Acharya, A., & Withana, N. P. (2008). Groups with Maritime Terrorist Capabilities in the Indian Ocean. In V. R. Raghavan, & W. L. Prabhakar (Eds.), *Maritime security in the Indian Ocean region*. New Delhi: Tata McGraw- Hill.
- Adams, R. H. (2004). Economic growth, inequality and poverty: Estimating the growth elasticity of poverty. *World Development* .
- Ahmed, M., & Suphachalasai, S. (2014). *Assessing the Costs of Climate Change and Adaptation in South Asia*. Asian Development Bank.
- Alkire, S., & Foster, J. (2010). Designing the Inequality-Adjusted Human Development. *Oxford Poverty & Human Development Initiative (OPHI)* .
- Allen, C., & Clouth, S. (2012). *A guidebook to the Green Economy*. Division for Sustainable Development, UNDESA.
- Alwis, R. (2010). Promoting tourism in South Asia.
- Andersen, P. P., & Hazell, B. R. (1985). The Impact of the Green Revolution and Prospects for the Future. *Food Reviews International* .
- Arif, A. A., & Karim, M. E. (2013). Marine pollution and the South Asian Coastal States . *Macquarie Journal of International and Comparative Environmental Law* .
- Bajpai, N., Sachs, J. D., & Volavka, N. H. (2004). Reaching the Millennium Development Goals in South Asia. *Working Papers Series* .
- Balaram, R. A. (2012). Case Study: The Myanmar and Bangladesh Maritime Boundary Dispute in the Bay of Bengal and Its Implications for South China Sea Claims. *Journal of Current Southeast Asian Affairs* .
- Baumann, P. (2002). *Improving access to natural resources for the rural poor: A critical analysis of central concepts and emerging trends from a sustainable livelihoods perspective*. FAO.
- Bebbington, A. (1999). *Capitals and Capabilities: a Framework for Analysing Peasant Viability, Rural Livelihoods and Poverty International Institute for Environment and Development*.
- Bensch, A., Gianni, M., Gréboval, D., Sanders, J., & Hjort, A. (2009). *Worldwide review of bottom fisheries in the high seas*. Rome: FAO.

- Besley, T., & Burgess, R. (2003). Halving Global Poverty. *The Journal of Economic Perspectives* , XVII.
- BIMSTEC*. (2014). Retrieved 2014, from Third BIMSTEC Summit Declaration: <http://www.bimstec.org/downloads/3rd-bimstec-summt/3rd-bimstec-summit-declaration.pdf>
- Blue Flag*. (2014). Retrieved 2014, from <http://www.blueflag.org/>
- BOBLME*. (2010). Retrieved 2014, from Integrated Coastal Management (ICM): Best Practices and Lessons Learned from the South Asian Countries of the Bay of Bengal Large Marine Ecosystem (BOBLME): www.boblme.org
- Boczek, B. A. (1984). Global and Regional Approach to the Protection and Preservation of the Marine Environment. *Case Western Reserve Journal of International Law* .
- bp*. (2011). Retrieved 2014, from Statistical Review of World Energy 2011: <http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html>
- Brenner, J., Jimenez, J. A., Sarda, R., & Garola, A. (2010). An assessment of the non-market value of the ecosystem services provided by the Catalan coastal zone, Spain. *Ocean & Coastal Management* .
- Bresciani, F., & Valdés, A. (2007). *Beyond Food Production: The Role of Agriculture in poverty reduction*. Rome: FAO.
- Burke, W. J., & Jayne, T. S. (2010). *Spatial disadvantages or spatial poverty traps*. London: Overseas Development Institute.
- Cassman, K. G., Dobermann, A., Walters, D. T., & Yang, H. (2003). Meeting cereal demand while protecting natural resources and improving environmental quality. *Annual Review of Environment and Resources* .
- (2009). *Cast-based discrimination in South Asia*. Dhaka: International Dalit Solidarity Network.
- CBD*. (2014). Retrieved 2014, from List of Parties: <http://www.cbd.int/information/parties.shtml>
- Chape, S., Blyth, S., Fish, L., Fox, P., & Spald, M. (2003). *2003 United Nations List of Protected Areas*. IUCN, UNEP-WCMC.
- Christiaensen, L., & Demery, L. (2007). *Down to Earth Agriculture and poverty reduction in Africa*. The World Bank group.

- Cicin-Sain, B., Balgos, M., Appiott, J., Wowk, K., & Hamon, G. (2011). Oceansat Rio+20: How Well Are We Doing in Meeting the Commitments from the 1992 Earth Summit and the 2002 World Summit on Sustainable Development? Summary for Decision Makers . *Global Ocean Forum* .
- Cicin-Saina, B., & Belfiore, S. (2005). *Linking marine protected areas to integrated coastal and ocean management: A review of theory and practice*. Ocean & Coastal Management.
- Clarke, P., & Jupiter, S. (2010). *Principles and practice of Ecosystem Based Management: A Guide for conservation practitioners in the tropical western Pacific*. New York: Wildlife Conservation Society.
- CLCS. (2014, July 21). Retrieved 2014, from Submissions, through the Secretary-General of the United Nations, to the Commission on the Limits of the Continental Shelf, pursuant to article 76, paragraph 8, of the United Nations Convention on the Law of the Sea of 10 December 1982: http://www.un.org/depts/los/clcs_new/commission_submissions.htm
- CMS. (2013). Retrieved 2014, from Parties and Range States: <http://www.cms.int/en/parties-range-states>
- Cole, J. P. (1981). *The Development Gap*. John Wiley and Sons Ltd.
- Conway, G. R., & Barbier, E. B. (2013). *After the Green Revolution: Sustainable Agriculture for Development*. Routledge.
- Cruz, R. V., Harasawa, H., Lal, M., Wu, S., Anokhin, Y., Punsalmaa, B., et al. (2007). *Asia. Climate change, 2007, impacts, adaptation and vulnerability*.
- Cummins, V., Mahony, O., & Connolly, N. (2004). *Review Of Integrated Coastal Zone Management & Principals Of Best Practice*. Coastal and Marine Resources Centre, University College Cork, Ireland.
- Das, R. J. (2002). The green revolution and poverty: a theoretical and emperical examination of the relation between technology and socciety. *Geoforum* .
- De Fontaubert, C., & Lutchman, I. (2003). *Achieving Sustainable Fisheries: Implementing the New International Legal Regime*. IUCN.
- de Mallorca, P. (2007). *Building an ecosystem approach to aquaculture*. Rome: FAO.
- De Young, C. (2006). Review of the state of world marine capture fisheries management: Indian Ocean. *FAO Fisheries* .

- De, P. (2013). *Connectivity, Trade Facilitation and Regional Cooperation in South Asia*. Commonwealth Secretariat.
- Delavande, A., & Zafar, B. (2013). *Gender Discrimination and Social Identity: Experimental Evidence from Urban Pakistan*. Federal Reserve Bank of New York.
- Delgado, C. L., Wada, N., Rosegrant, M. W., Meijer, S., & Ahmed, M. (2003). *Fish to 2020: Supply and demand in changing global markets*. International Food Policy Research Institute and WorldFish Center.
- DFID. (2004). Retrieved 2014, from Agriculture, growth and poverty reduction: <http://dfid-agriculture-consultation.nri.org/summaries/wp1.pdf>
- Drexhage, J., & Murphy, D. (2010). *Sustainable Development: From Brundtland to Rio 2012*. International Institute for Sustainable Development.
- Earth Negotiations Bulletin*. (2002). Retrieved from Summary of the World Summit on Sustainable Development: www.iisd.ca
- Ebrahim, N. (2012). *Future Challenges*. Retrieved 2014, from Oceans at Rio+20 and beyond: envisioning a blue economy for the world: <http://futurechallenges.org/local/oceans-at-rio20-and-beyond-envisioning-a-blue-economy-for-the-world/>
- (1993). *Economic Survey*. New Delhi: Government of India, Ministry of Finance.
- ECOSOC. (2014). Retrieved 2014, from Millennium Development Goals and post-2015 Development Agenda: <http://www.un.org/en/ecosoc/about/mdg.shtml>
- Ehler, C., & Douvère, F. (2009). *Marine Spatial Planning: a step-by-step approach toward ecosystem-based management*. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. Paris: UNESCO.
- EIA. (2014). Retrieved 2014, from India: Full report: <http://www.eia.gov/countries/analysisbriefs/India/india.pdf>
- ESCAP. (2012). Retrieved from Growing Together: Economic Integration for an Inclusive and Sustainable Asia-Pacific Century: www.unescap.org
- Evenson, R. E., & Pingali, P. L. (2007). *Handbook of Agricultural Economics*. Amsterdam: Elsevier.
- Falcon, W. P. (1970). The Green Revolution: Generations of Problems. *American Journal of Agricultural Economics* .

- Fan, S., Gulati, A., & Thorat, S. (2008). Investment, subsidies, and pro-poor growth in rural India. *Agricultural Economics* .
- FAO. (2006). Retrieved 2014, from The State of Food and Agriculture in Asia and the Pacific: <http://www.fao.org/docrep/009/ag086e/ag086e02.htm>
- FAO. (2009). Retrieved 2014, from FAO's Director-General on How to Feed the World in 2050: http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf
- FAO. (2011). (FAO Fisheries and Aquaculture Department) Retrieved 2014, from Review of the state of world marine fishery resources: <http://www.fao.org/docrep/015/i2389e/i2389e.pdf>
- FAO. (2014). Retrieved 2014, from 2012 FAO Yearbook: <http://www.fao.org/3/478cfa2b-90f0-4902-a836-94a5dddd6730/i3740t.pdf>
- FAO. (2014). Retrieved 2014, from Signing on to the Code of Conduct for Responsible Fisheries: Experiences from the Bay of Bengal: <http://www.fao.org/docrep/006/AD365E/AD365E00.HTM>
- FAO. (2014). Retrieved 2014, from Indian Ocean Tuna Commission (IOTC): <http://www.fao.org/fishery/rfb/iotc/en>
- FAO. (2014). Retrieved 2014, from Organic Agriculture: FAQ: <http://www.fao.org/organicag/oa-faq/oa-faq5/en/>
- Farmer, B. H. (1981). The "Green Revolution" in South Asia. *Geography* , LVI, 202-207.
- Faye, M. L., McArthur, J. W., Sachs, J. D., & Snow, T. (2004). The Challenges Facing Landlocked Developing Countries. *Journal of Human Development* .
- Feder, G., & O'Mara, G. (1981). Farm size and the diffusion of green revolution technology. *Economic Development and Cultural Change* .
- Fischer, G., Hizznyik, E., Prieler, S., & Wiberg, D. (2011). Scarcity and abundance of land resources: competing uses and the shrinking land resource base. *FAO SOLAW Background Thematic Report-TR02* .
- Freeman, P. K., Keen, M., & Mani, M. (2003). Being prepared: Natural disasters are becoming more frequent, more destructive, and deadlier, and poor countries are being hit the hardest. *Finance and Development* , 42-45.

- Freitas, B., Delagran, L., Griffin, E., & Miller, K. (2008). *Too Few Fish: A Regional Assessment of the World's Fisheries*. Washington, DC: OCEANA.
- Funge-Smith, S., Briggs, M., & Miao, W. (2013). *Regional overview of fisheries and aquaculture in Asia and the Pacific 2012*. FAO.
- Ganzel, B. (2007). *The Mexican Agricultural Program*. Retrieved August 2014, from Living History Farm: http://www.livinghistoryfarm.org/farminginthe50s/crops_14.html
- Gardner, S., Tonts, M., & Elrick, C. (2006). *A Socio-economic Analysis and Description of the Marine Industries of Australia's South-west Marine Region*. Department of the Environment and Water Resources, Commonwealth of Australia.
- Gaurav, D., & Ravallion, M. (1996). How Important to India's Poor is the Sectoral Composition of Economic Growth? *World Bank Economic Review* .
- Ghani, E. (2011, March). The South Asian Development Paradox: Can Social Outcomes Keep Pace with Growth? *Economic Premise* .
- Ghani, E. (2010, October). *VOX*. Retrieved May 2014, from The poor half billion: What is holding back lagging regions in South Asia?: <http://www.voxeu.org/article/poor-half-billion-pockets-poverty-south-asia>
- Ghatak, S. (2004). Women and Poverty in South Asia.
- Ghosh, P. K. (2004). Maritime Security Challenges in South Asia and the Indian Ocean: Response Strategies. *American-Pacific Sealanes Security Institute conference*. Honolulu: Center for Strategic and International Studie.
- (2013). *Global Hunger Index*. International Food Policy Research Institute.
- Gore, C. (2000). The Rise and Fall of the Washington Consensus as a Paradigm for Developing Countries. *World Development* , XXVIII (05), 789-804.
- Government of India*. (2013). Retrieved 2014, from Ministry of New and Renewable Energy: <http://pib.nic.in/newsite/erelease.aspx?relid=98283>
- Government of Pakistan*. (2014). (Ministry of Petroleum & Natural Resources) Retrieved 2014, from Opportunities in Pakistan's Upstream Oil & Gas Sector.
- GWP*. (2012). Retrieved 2014, from Technical report on Issues related to Water and Agriculture in South Asia:

<http://www.gwp.org/Global/Activities/South%20Asia/gwp-apan-technical-report-issues-water-agriculture-south-asia.pdf>

- Hagenaars, A., & de Vos, K. (1988). The Definition and Measurement of Poverty. *The Journal of Human Resources* .
- Hall, M. (2001). Trends in ocean and coastal tourism: the end of the last frontier? *Ocean & Coastal Management* , 601-618.
- Haq, B. U. (1997). *Coastal Zone Management Imperative for Maritime Developing Nations*. Springer Science & Business Media.
- Hardin, G. (1968). The Tragedy of the Commons. *Science* .
- Harrould-Kolieb, E. (2008). *Shipping impacts on climate*. OCEANA.
- Hasan, R., & Quibria, M. G. (2004). Industry Matters for Poverty: A Critique of Agricultural Fundamentalism. *Kyklos* , 253-264.
- Hazell, P. B. (2009). *The Asian Green Revolution*. International Food Policy Research Institute.
- Henderson, L. (2004). Emergency and disaster: Pervasive risk and public bureaucracy in developing nations. *Public Organization Review: A Global Journal* , 103-119.
- Hicks, N. L. (2011). *The Challenge of Economic Development: A Survey of Issues and Constraints Facing Developing Countries*. AuthorHouse.
- Honey, M., & Krantz, D. (2007). *Global Trends in Coastal Tourism*. Washington, DC: World Wildlife Fund.
- HOPE. (2014). *Healthy Oceans Productive Ecosystems*. Brussels: European Commission.
- Hugé, J., & Waas, W. (2011). Corporate social responsibility for sustainable development.
- Ibrahim, H. S., & Hegazy, I. (2013). Decentralization in the Egypt coastal management. *Journal of Coastal Development* , XVI.
- IFAD. (2010). (International Fund for Agriculture Development) Retrieved July 2014, from Rural Poverty: www.ifad.org
- IFAD. (2014). Retrieved 2014, from IFAD's approach in Small Island Developing States: A global response to island voices for food security: http://www.ifad.org/english/sids/ifad_SIDS.pdf

- IFPRI*. (2007). Retrieved 2014, from Agricultural and rural developmet for reducing poverty and hunger in Asia: in pursuit of inclusive and Sustainable growth:
<http://www.ifpri.org/sites/default/files/publications/adbmanilasynopsis.pdf>
- IFPRI*. (2008). (Aga Khan Foundation) Retrieved 2014, from Women in Agriculture in South Asia: <http://www.ifpri.org/event/women-agriculture-south-asia>
- ILO*. (2014). Retrieved 2014, from Women seafarers: Fighting against the tide? As on land, so by sea: Women join the ranks of seafarers:
http://www.ilo.org/global/publications/magazines-and-journals/world-of-work-magazine/articles/WCMS_081322/lang--en/index.htm
- IMO*. (2014). Retrieved 2014, from Status of conventions:
<http://www.imo.org/About/Conventions/StatusOfConventions/Pages/Default.aspx>
- International Food Policy Research Institute*. (2013). Retrieved 2014, from Global Hunger Index, The Challenge of hunger: Building resilience to achieve food and nutrition security :
<http://www.ifpri.org/sites/default/files/publications/ghi13.pdf>
- IOTC*. (2009). Retrieved 2014, from Report of the IOTC Performance Review Panel: file:///C:/Users/imali/Downloads/IOTC-2009-PRP-R[E].pdf
- Isager, L. (2008). *Coastal Zone Management in developing countries with Kenya as a perticular example*.
- Islam, K. S., Zhi Xue, X., & Rahman, M. M. (2009). Successful Integrated Coastal Zone Management (ICZM) Program Model of a Developing Country (Xiamen, China) – Implementation in Bangladesh Perspective. *Journal of Wetlands Ecology , II*.
- IUCN*. (2006). Retrieved 2014, from The Future of Sustainability: Re-thinking Environment and Development in the Twenty-first Century, ed. WM Adams, International Union for Conservation of Nature:
http://cmsdata.iucn.org/downloads/iucn_future_of_sustanability.pdf>
- IUCN*, C. a. (2008). *Managing Marine and Coastal Protected Areas: A Toolkit for South Asia*.
- Jucan, C. N., & Jucan, M. S. (2013). Gender Trends in Tourism Destination. *Social and Behavioral Sciences* .
- Kabeer, N. (2003). *Gender Mainstreaming in Poverty Eradication and the Millennium Development Goals—A Handbook for Policy-makers and*

Other Stakeholders. Commonwealth Secretariat, International Development Research Centre.

- Kahl, J. A., & Davis, J. A. (1955). A Comparison of Indexes of Socio-Economic Status. *American Sociological Review* , XX.
- Kaplan, R. D. (2010). *South Asia's Geography of Conflict*. Center for a new American Security.
- Karim, M. S. (2008). The UNCLOS and regional action for protection of the marine environment: Perspectives of the South Asian Seas region. *Bangladesh Institute of International and Strategic Studies Journal* .
- Kathiresan, K. (2008). *Threats to Mangroves: Degradation and destruction of mangroves*. Centre of Advanced Study in Marine Biology. Annamalai University, India.
- Khan, M. A., & Shah, A. A. (2009). Sustainable Development of Agriculture in South and Central Asian Regions – A Key to Prosperity. *Central Asia Journal* .
- Kohler, S. (1943). *The Green Revolution*. Rockefeller Foundation.
- Kusakabe, K. (2003). *Gender Issues in Small Scale Inland Fisheries in Asia: Women as an important source of information*. FAO.
- Lee, D., & Neves, B. (2009). *Rural Poverty and Natural Resources: Improving Access*. Rome: IFAD Rural Poverty Report Workshop.
- Lopes, C. (2012). Economic Growth and Inequality: The New Post-Washington Consensus. *RCCS Annual Review* .
- Mandale, M., Foster, M. E., & Plumstead, J. (1998). *Estimating the economic value of coastal and ocean resources: The case of Nova Scotia*. Oceans Institute of Canada and the Atlantic Coastal Zone Information Steering Committee.
- Martosubroto, P. (2005). *FAO Regional Review of the Eastern Indian Ocean*. FAO.
- Maxwell, S. (2005). The Washington Consensus is dead! Long live the meta-narrative!
- McCord, G., Sachs, J. D., & Woo, W. T. (2005). Understanding African Poverty: Beyond the Washington Consensus to the Millennium Development Goals Approach. *Africa in the World Economy - The National, Regional and International Challenges* .

- McIntyre, B. D., Herren, H. R., Wakhungu, J., & Watson, R. T. (Eds.). (2009). *Agriculture at a Crossroads: The Global Report*. Washington, DC: International Assessment of Agricultural Knowledge, Science and Technology for Development.
- MEA. (2005). Retrieved 2014, from Ecosystems and Human Wel-Being: Synthesis report: www.millenniumassessment.org
- Mehrotra, S., & Kapoor, S. (2009). Gender Discrimination in Asia: A Regional Perspective. *Global Social Policy* .
- Melamed, C., & Samman, E. (2013). *Equity, Inequality and Human Development in a post-2015 Framework*. New York: United Nations Development Programme.
- Memon, N. (2012). *Disasters in South Asia – A Regional Perspective*. Karachi: Pakistan Institute of Labour Education and Research.
- Michel, D., & Sticklor, R. (Eds.). (2012). *Indian Ocean Rising: Maritime Security and policy challenges*. Washington, DC: Stimson.
- Michel, D., & Sticklor, R. (2012). *Indian Ocean Rising: Maritime Security and Policy Challenges*. Washington, DC: Stimson.
- Miththapala, S., Sawarkar, S., Krishnan, P., & Ariyabandu, M. M. (2012). *A tool kit for integrating Disaster Risk Reduction and Climate Change Adaptation in to Ecosystem Management of Coastal and Marine Areas in South Asia*. New Delhi: UNISDR/UNDP.
- Miththapala, S., Sawarkar, V., Krishnan, P., & Ariyabandu, M. M. (2012). *A toolkit for Integrating Disaster Risk Reduction and Climate Change Adaptation in to Ecosystem Management of Coastal and Marine Areas in South Asia*. UNISDR/UNDP.
- Mohsin, A., Sivaraman, S., Shaik, S. N., & Kodikara, C. (2010). *Religion —A tool for discrimination in South Asia?* Colombo: South Asians for Human Rights (SAHR).
- Muhammad, K., & Iqbal, J. (2013). *Pakistan Shipbreaking Outlook: The Way Forward for a Green Ship Recycling Industry – Environmental, Health and Safety Conditions*. Sustainable Development Policy Institute and the NGO Shipbreaking Platform.
- Muñoz, E. (2008). *The Millennium Development Goals: Facing Down Challenges*. Washington, DC: bread for the world institute.

- Nellemann, C., Corcoran, E., Duarte, C., Valdés, L., De Young, C., Fonseca, L., et al. (2009). *Blue Carbon. A Rapid Response Assessment*. UNEP.
- Newton, K., Cote, I., Pilling, G., Jennings, S., & Dulvey, N. (2007). Current and Future Sustainability of Island Coral Reef Fisheries. *Current Biology* .
- Ngwawi, J. (2014, February). Blue economy: Alternative development paradigm for SADC. *SADC Today* , XXVI.
- OECD. (2010). Retrieved 2014, from “GDP per capita”, in National Accounts at a Glance 2009: <http://dx.doi.org/10.1787/9789264075108-5-en>
- OECD. (2012). Retrieved 2014, from OECD Tourism Papers: Green Innovation in Tourism Services:
<http://www.oecd.org/cfe/tourism/GREEN%20INNOVATION%20IN%20TOURISM%20WORKING%20PAPER.pdf>
- OECD. (2014). Retrieved July 2014, from Poverty reduction:
<http://www.oecd.org/dac/povertyreduction/>
- Paliwal, A. (2012). *Down To Earth*. Retrieved from Gujarat set to develop India’s first tidal energy plant: <http://www.downtoearth.org.in/content/gujarat-set-develop-india-s-first-tidal-energy-plant>
- Park, P., & Padma, T. V. (2012). *India joins deep sea mining race*. The Guardian.
- Pauli, G. (2009). *The Blue Economy: A Report to the Club of Rome 2009*. Singapore.
- Perera, N. (2005). *The status of marine and coastal protected areas in the South Asian Seas Region: meeting the 2012 Global Biodiversity Target*.
- Pettinger, T. (2013). *Washington consensus – definition and criticism*. Retrieved 2014, from <http://www.economicshelp.org>
- Pingali, P. L. (2012). Green Revolution: Impacts, limits, and the path ahead. *Proceedings of the National Academy of Sciences* .
- Pop, O., Dina, G. C., & Martin, C. (2011). Promoting the corporate social responsibility for a green economy and innovative jobs. *Procedia Social and Behavioral Sciences* (15).
- Postel, S. (1989). *Water for Agriculture: Facing the Limits*. Worldwatch Institute.
- (2006). *Poverty profile: India*. Japan Bank for International Cooperation.

- RAEng. (2013). Retrieved 2014, from Future ship powering options: Exploring alternative methods of ship propulsion:
<http://www.raeng.org.uk/publications/reports/future-ship-powering-options>
- Rahman, C. (2009). *Concepts of Maritime Security: A strategic perspective on alternative visions for good order and security at sea, with policy implications for New Zealand*. Victoria University of Wellington.
- Rajasuriya, A., Maniku, M. H., Subramanian, B. R., & Rubens, J. (1999). *Coral reef ecosystems in South Asia*. Stockholm: CORDIO, SAREC Marine Science Program.
- Ramsar. (2014). Retrieved 2014, from Contracting Parties to the Ramsar Convention on Wetlands: http://www.ramsar.org/cda/en/ramsar-about-parties-parties/main/ramsar/1-36-123%5E23808_4000_0__
- Rangarajan, C. (1982). *Agricultural Growth and Industrial Performance in India*. Washington DC: International Food Policy Research Institute (IFPRI).
- Rao, G. S., & George, G. (2013). Green Technologies in Marine Fisheries for Sustainably Exploiting and Conserving the Blue Carbon - CMFRI Initiatives and Accomplishments. *International symposium on green fisheries* .
- Remoundou, K., Koundouri, P., Kontogianni, A., Nunes, P. A., & Skourtos, M. (2009). Valuation of natural marine ecosystems: an economic perspective. *environmental science & policy* .
- Roe, D. (2013). The Millennium Development Goals and natural resources management: reconciling sustainable livelihoods and resource conservation or fuelling a divide? In D. Satterthwaite (Ed.), *The Millennium Development Goals and Local Processes: Hitting the target or missing the point* . IIED.
- Rorabacher, J. A. (2010). *Hunger and Poverty in South Asia*. Gyan Publishing House.
- Rose, G. L. (2011). *Gaps in the Implementation of Environmental Law at the National, Regional and Global Level*. Kuala Lumpur, Malaysia: World Congress on Justice, Governance and Law for Environmental Sustainability.
- Rosegrant, M. W., & Hazell, P. B. (2000). *Transforming the rural Asia economy: The unfinished revolution*. Hong Kong: Oxford University Press.

- Rosegrant, M. W., Ringler, C., Benson, T., Diao, X., Resnick, D., Thurlow, J., et al. (2006). *Agriculture and achieving the Millennium Development Goals*. International Food Policy Research Institute.
- Rumley, D. (Ed.). (2013). *The Indian Ocean Region: Security, Stability and Sustainability in the 21st Century*. Australia India Institute.
- SAARC. (2009). Retrieved 2014, from SAARC Summit: <http://www.saarc-sec.org/userfiles/Summit%20Declarations/13%20-%20Dhaka%20-%2013th%20Summit%2012-13%20Nov%202005.pdf>
- SAARC CZMC. (2013). Retrieved 2014, from About SCZMC: <http://www.sczmc.org/about-sczmc/>
- SACEP. (2014). Retrieved 2014, from South Asia Cooperative Environment Program: http://www.sacep.org/html/sas_actionplan.htm
- Scherr, S. J., & Yadav, S. (1996). *Land Degradation in the Developing World: Implications for Food, Agriculture, and the Environment to 2020*. Washington, D.C: International Food Policy Research Institute.
- Schoolmeester, T., & Baker, E. (2009). *Continental Shelf: The Last Maritime Zone*. UNEP/GRID-Arendal.
- Sea around us project. (2014). Retrieved 2014, from EXCLUSIVE ECONOMIC ZONES (EEZ): <http://www.seaaroundus.org/eez/>
- Setboonsarng, S. (2006). Organic Agriculture, Poverty Reduction, and the Millennium Development Goals. *Asian Development Bank Institute* .
- Sharma, R. C., & Sharma, N. (2013). Energy from the Ocean and Scope of its Utilization in India. *International Journal of Environmental Engineering and Management* , 397-404.
- Shi, Y. (2014). *Greenhouse gas emissions from international shipping: the response from China's shipping industry to the regulatory Initiatives of the International Maritime Organization*. University of Wollongong.
- Shiva, V. (1991). *The Violence of Green Revolution: Third World Agriculture, Ecology and Politics*. Zed Books.
- SIDSnet. (2014). Retrieved 2014, from Blue Economy Summit 19 - 20 January 2014: <http://www.sidsnet.org/news/blue-economy-summit-19-20-january-2014>

- Solomon, S., Quin, D., Manning, M., Marquis, M., Averyt, K., Tignor, M. M., et al. (2007). *Climate Change 2007: The Physical Science Basis*. Cambridge University Press.
- Soubbotina, T. P., & Sheram, K. A. (2000). Poverty. In *Beyond economic growth : meeting the challenges of global development* (p. The International Bank for Reconstruction/World bank). Washington, D.C.
- Sridharan, E. (2014). In S. Kumar (Ed.), *Stability and growth in South Asia*. New Delhi: PENTAGON PRESS.
- Stern, N. (2007). The economics of climate change. *The stern review* .
- Subasinghe, R. P., Curry, D., McGladdery, S. E., & Bartley, D. (2003). Recent Technological Innovations in Aquaculture. *Review of the State of World Aquaculture, FAO Fisheries Circular* .
- Subasinghe, R. (1997). *Review of the state of world aquaculture*. Rome: FAO.
- Subramanian, S. (2005). *Headcount Poverty Comparisons*. International Poverty Center. United Nations Development Program.
- Sumaila, U. R., Lam, V., Le Manach, F., Swartz, W., & Pauly, D. (2013). *Global Fisheries Subsidies*. European Union.
- Sweijjs, T., Cleven, W., Levi, M., Tabak, J., Speear, Z., & de Jonge, J. (2010). *The Maritime Future of the Indian Ocean*. The Hague Centre for Strategic Studies.
- Teh, L. C., & Sumaila, U. R. (2013). Contribution of marine fisheries to worldwide employment. *Fish and Fisheries* , XIV (1).
- Thapa, G. (2004). Rural Poverty Reduction Strategy for South Asia. *Australian South Asia Research Centre*. Rome: International Fund for Agricultural Development.
- (2014). *The AIMS index of marine industry*. Australian Institute of Marine Sciences.
- The future we want. (2012). *Rio+20*. Rio de Janeiro: United Nations.
- The World Bank*. (2001). Retrieved from World Development Report: www.worldbank.org
- The World Bank*. (2008). Retrieved 2014, from Environment Matters 2008: Annual Review of World Bank projects. This edition focuses on Valuing Coastal and Marine Ecosystem Services.: www.theworldbank.org

- The World Bank*. (2013). Retrieved 2014, from Population:
<http://data.worldbank.org>
- The World Bank*. (2013). Retrieved 2014, from Agriculture, value added (% of GDP): <http://data.worldbank.org>
- The World Bank*. (2013). Retrieved 2014, from Agricultural land (% of land area):
<http://data.worldbank.org/indicator/AG.LND.AGRI.ZS?display=default>
- The World Bank*. (2013). Retrieved 2014, from Liner shipping connectivity index:
<http://data.worldbank.org/indicator/IS.SHP.GCNW.XQ/countries/1W-8S?display=default>
- The World Bank*. (2014). Retrieved May 2014, from GDP per capita (current US\$): <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
- The World Bank*. (2014). Retrieved 2014, from Land Area (sq.km):
<http://data.worldbank.org/indicator/AG.LND.TOTL.K2>
- Tyedmers, P. (2004). Fisheries and energy use. (C. Cleveland, Ed.) *Encyclopedia of energy* .
- Tyedmers, P., & Parker, R. (2012). *Fuel Consumption and Greenhouse Gas Emissions from Global Tuna Fisheries: A preliminary Assessment*. International Seafood Sustainability Foundation.
- ul Haq, M. (2003). The birth of the Human Development Index. In S. Fukuda-Parr, & A. K. Shiva Kuma (Eds.), *Readings in Human Development* (pp. 127-137). Oxford: Oxford University Press.
- UN. (2013). Retrieved 2014, from A new global partnership: eradicate poverty and transform : <http://report.post2015hlp.org/>
- UN. (2014). Retrieved 2014, from The Millennium Development Goals Report:
www.un.org
- UN Conference on SIDS*. (2014). Retrieved 2014, from Blue Economy Concept Paper: <http://www.sids2014.org/content/documents/275BEconcept.pdf>
- UN human rights*. (2014). Retrieved 2014, from Universal Declaration of Human Rights: <http://www.ohchr.org/EN/UDHR/Pages/Introduction.aspx>
- (1992). *UNCED*. Rio de Janeiro: United Nations.
- UNCLOS-Article 56*. (1982). Retrieved June 2014, from Oceans and Law of the Sea:
http://www.un.org/depts/los/convention_agreements/texts/unclos/part5.htm

- UNCLOS-Article 77*. (1982). Retrieved June 2014, from Oceans and Law of the Sea:
http://www.un.org/depts/los/convention_agreements/texts/unclos/part6.htm
- UNDP*. (2010). (United Nations Development Program) Retrieved 2014, from Beyond the Midpoint: Achieving.
- UNEP*. (2008). Retrieved 2014, from Freshwater under Threat, South Asia:
www.unep.org/pdf/southasia_report.pdf
- UNEP*. (2011). Retrieved 2014, from Towards a green economy: Pathways to sustainable development and Poverty eradication:
http://www.unep.org/greeneconomy/Portals/88/documents/ger/ger_final_dec_2011/Green%20EconomyReport_Final_Dec2011.pdf
- UNEP*. (2011). Retrieved 2014, from Renewable energy: Investing in energy and resource efficiency:
http://www.unep.org/greeneconomy/Portals/88/documents/ger/GER_6_RenewableEnergy.pdf
- UNEP*. (2012). Retrieved 2014, from Green Economy in a Blue world: Synthesis Report: www.unep.org/greeneconomy and www.unep.org/regionalseas
- UNEP*. (2012). Retrieved 2014, from Human Rights and the Environment:
<http://www.unep.org/delc/Portals/119/JointReportOHCHRandUNEPonHumanRightsandtheEnvironment.pdf>
- UNEP*. (2014). Retrieved 2014, from Wealth in the Oceans: Deep sea mining on the horizon?: www.unep.org/geas
- UNEP*. (2014). Retrieved 2014, from environment for development: Regional Seas Program: <http://www.unep.org/regionalseas/about/default.asp>
- UNEP*. (2014). Retrieved 2014, from Division of Environmental Law and Conventions:
<http://www.unep.org/delc/GreenEconomy/tabid/54399/Default.aspx>
- UNEP-WCMC*. (2008). *National and Regional Networks of Marine Protected Areas: A Review of Progress*. Cambridge: UNEP-WCMC.
- UNESCO*. (2014). Retrieved 2014, from States Parties: Ratification Status:
<http://whc.unesco.org/en/statesparties/>
- UNESCO IOC*. (2014). Retrieved 2014, from Marine Spatial Planning Initiative:
http://www.unesco-ioc-marinesp.be/marine_spatial_planning_msp

- United Nations*. (2013, December). (United Nations Statistics Division) Retrieved May 2014, from National Accounts Main Aggregates Database:
<http://unstats.un.org/unsd/snaama/dnllist.asp>
- United Nations Development Programme*. (2013). Retrieved May 2014, from Human Development Report 2013, The Rise of the South: Human Progress in a Diverse World:
http://hdr.undp.org/sites/default/files/reports/14/hdr2013_en_complete.pdf
- USAID*. (2006). Retrieved 2014, from Issues in poverty reduction and natural resource management:
<http://www.usaid.gov/sites/default/files/documents/1862/issues-in-poverty-reduction-and-natural-resource-management.pdf>
- USAID*. (2010). Retrieved 2014, from Final Report Findings and Recommendations: <https://www.climate-eval.org/sites/default/files/evaluations/299%20Asia-Pacific%20regional%20climate%20change%20adaptation%20assessment%20final%20report%20%20findings%20and%20recommendations.pdf>
- Vanhoutte, K. (2009). *Algae for a Second Green Revolution*. sbae industries.
- Vienna Convention Article 18*. (1969). Retrieved 2014, from Vienna Convention on the law of treaties (with annex):
<http://www.jstor.org/stable/pdfplus/20672774.pdf?&acceptTC=true&jpdConfirm=true>
- Visbeck, M., Kronfeld-Goharani, U., Neumann, B., Rickels, W., Schmidt, J., & van Doorn, E. (2013). *A Sustainable Development Goal for the Ocean and Coasts*. Kiel: Kiel Institute for the World Economy.
- WCED. (1987). *Our Common Future*. Oxford University Press.
- Williamson, J. (2000). What Should the World Bank Think about the Washington Consensus?
- Wodon, Q. (1999). Growth, Poverty and Inequality: A Regional Panel for Bangladesh.
- World Bank*. (2008). Retrieved July 2014, from Agriculture and poverty reduction:
http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1171488994713/3455847-1192738003272/Brief_AgPovRedctn_web.pdf
- WTO*. (2002). Retrieved 2014, from Tourism and poverty Alleviation:
www.wto.org
- WTO*. (2008). Retrieved 2014, from World Trade Report: www.wto.org

Young, A. (1993). *Land Degradation in South Asia: Its Severity, Causes, and Effects Upon People*. Rome: FAO, UNDP, UNEP.

Zhao, R. (2013). *The role of the ocean industry in the Chinese national economy: An input-output analysis*.

Appendix A:



Appendix A. Map of South Asia

