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Economics of Climate Change:

Decoupling Economic Growth from Carbon Emissions Related Environmental Degradation

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"Climate change is real. There will always be uncertainty in understanding a system as complex as the world's climate. However there is now strong evidence that significant global warming is occurring. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. It is likely that most of the warming in recent decades can be attributed to human activities "

Joint Science Academies' Statement:
The National Academies of Sciences, Engineering, and Medicine 2005

Introduction

There is a growing concern on the relationship between economic growth and its impact on the quality of the environment. Especially, the extensive use of fossil fuels for energy in line with the increase in economic activities and its negative consequences on environment is a global concern in today's policy circles. A growing economy consumes more and more inputs such as energy and material, which in turn could deteriorate the quality of the environment. As the economy grows, more carbon intensive economic activities which require burning more fossil fuels are taking place. Economic analysis suggests that the economic growth is linked with carbon emissions. In economic theories, the Environmental Kuznets Curve (EKC) is wildly used to explain the relationship between the economic growth and environmental degradation. The theory suggests that the carbon emissions increase at the initial stage of growth and gradually decline when the economy reaches to a certain level of per capita income. However, empirical analysis reveals that the carbon emissions are considerably higher even at higher income levels. One of the burning issues at the moment is the climate change and related global warming caused by the Green House Gas (GHG) emissions to atmosphere, particularly due to the extensive use of fossil fuels. Among other GHGs, emissions of Carbon Dioxide (CO_2) have dominated due to the higher demand for energy. A survey of Skeptical Science web site[1] concludes that 97% of the scientific papers they reviewed support the position that the recent developments in climate change are driven by human related actions. Further, eleven joint international science academies[2] have published a consensus statement on global response to climate change in 2005 mentioning that the atmospheric concentration

1 In 2013, this web site peer-reviewed over 12,000 abstracts published between 1991 and 2011 related to climate change and global warming to make the relevant statement on the relationship between human actions and carbon emissions.

2 This includes Royal Society of United Kingdom, National Academy of Sciences of United States of America, Russian Academy of Sciences, and Science Council of Japan etc.

of GHGs especially that of CO_2, is due to human activities. The statement further emphasises that the fossil fuels are the major source of human activity related CO_2 emissions. On the other hand, scientific researchers also reveal that recent climatic conditions impact the environment and thereby affecting the lives of human in a broad variety of ways. It changes the rainfall patterns, ecosystem and forests, impacts yields of agriculture crops, productivity and human health. Therefore, de-coupling the link between the economic growth and the CO_2 emissions has become a key concern in stabilising the atmospheric concentration of CO_2 at a level that will prevent any adverse impact to the climate system.

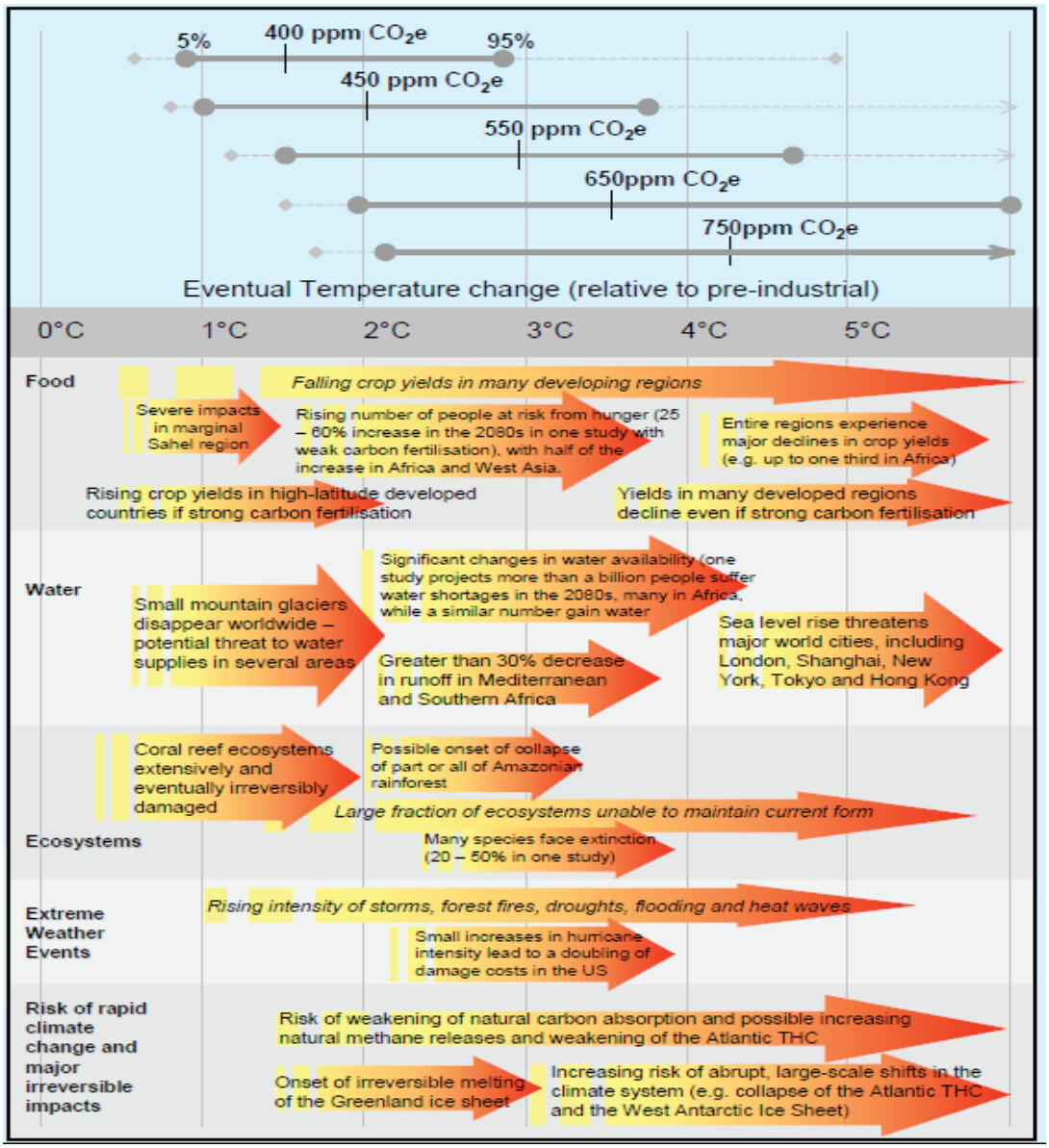
Climate Change and Consequences

Climate scientists recommend controlling the global average temperature increase to maximum of 2° Celsius above the temperature level observed in pre-industrial period (1750 - 1850) in order to avoid adverse consequences of climate change. The international treaty, the United Nations Framework Convention on Climate Change (UNFCCC), which was formed in 1992 provides the framework to combat the climate change through controlling the increase in global average temperature. The recent meeting of UNFCCC, the Paris Climate Conference 2015 pointed out that the global temperature has already risen by around 1° Celsius above the pre-industrial level. The conference also noted that the global temperature would increase by 3.7° Celsius to 4.8° Celsius by 2100 compared to the pre-industrial level, causing a significant impact on the society and natural systems if timely policy measures are not implemented.

Climate change impacts the human well-being through variety of channels. Stern (2007, p.294) has conducted a scientific analysis, which reflects the correlation between atmospheric concentration of GHGs, measured by parts per million (ppm) CO_2 equivalent (CO_2 e), and the climate change, measured by the increase in the global temperature above the pre-industrial level (Figure 1). The top panel of the figure shows GHG stabilisation levels in ppm CO_2e and the associated possible increase in global temperature in response to each level of increase in atmospheric concentration of GHGs. The solid horizontal lines are the probability ranges for temperature increase. The bottom panel explains the repercussions of climate change on food, water, ecosystem and environment at each level of increase in global temperature above the pre-industrial level.

The figure 1 further reveals that the impact of climate change is more severe to developing countries than to developed countries. Accordingly, increase in global temperature above the pre-industrial level reduces the crop yield in developing countries in Africa and Asia. Decline in crop yield would increase the danger of hunger as some of the developing countries largely depend on certain types of crops for their staple food. However, the developed countries in high latitudes might even benefit from the increase in temperature up to 2° Celsius above the pre-industrial level since the temperature increase could reduce the frozen land area thereby expanding their arable land extent. Further, a report published by Reuters in 2012, based on a statement of a humanitarian organization called DARA, concludes that five million die every year due to climate change related issues and extensive use of carbon, which can be increased to six million a year by 2030 with 90 percent of deaths occurring in developing countries, if prompt measures are not taken to reduce the extensive use of fossil fuel. Moreover, as revealed by the National Oceanic and Atmospheric Administration (NOAA) Annual Greenhouse Gas Index data,

Figure 1



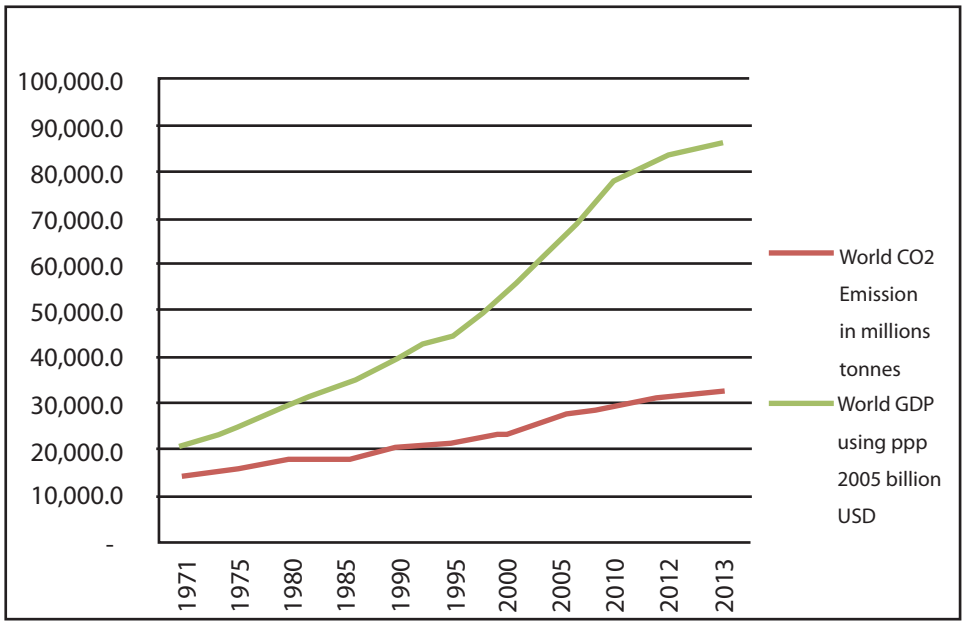
Source: Adapted from STERN REVIEW: The Economics of Climate Change in Stern,N (2007), P.294

which monitors the GHGs level in the atmosphere, the concentration of GHGs has reached 478 ppm CO_2 e level by now, of which 400 ppm are solely the emissions of CO_2 alarming the potential increase in global temperature out of the comfort zone.

Link between Economic Growth and CO_2 Emission

Increasing energy demand in line with the economic growth has become the main source of carbon emissions in recent decades. International Energy Agency (IEA) 2015 statistics highlight that 68 per cent of global anthropogenic GHG emissions are from the energy use, of which 90 per cent are directly CO_2 emissions. Further, out of total CO_2 emissions, 65 per cent is generated due to electricity and transport related activities, while agriculture and other industrial processes represent 11 per cent and 7 per cent of total CO_2 emissions, respectively. Figure 2 shows the link between the World Gross Domestic Product (GDP) measured by Purchasing Power Parity (PPP) and the CO_2

Figure 2

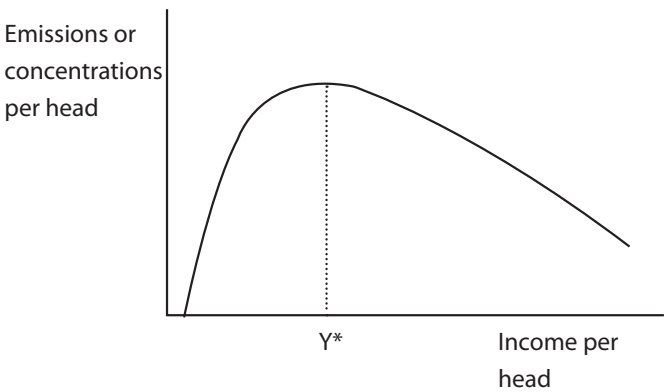


Source: International Energy Agency (IEA), 2015

emissions. It can be observed that the emissions gradually increase on par with the increase in GDP.

The relationship between environmental degradation and economic growth can be further explained using economic theories. EKC is one of the broadly used economic concepts which explain the relationship between the economic growth and environmental degradation. The theory suggests that, CO_2 emissions increase at a higher rate at the initial stages of the economic growth. As per capita income increases, CO_2 emissions gradually slowdown and start to decline after a certain level of income. This results in a bell shaped relationship between CO_2 emissions and income growth as shown in figure 3.

Figure 3



Source: Adapted from STERN REVIEW: The Economics of Climate Change in Stern, N (2007), P.191

Concept of Decoupling CO_2 Emissions from GDP Growth

Decoupling concept focuses on delinking economic growth from the environment degradation. There are two aspects related to the decoupling concept called relative decoupling and absolute decoupling (figure 4). If the environmental degradation (CO_2 emissions in this case) increases at a higher rate or at the same rate as the economy grows, it is referred as coupling. If the growth rate of environment degradation is taking place at a slower pace than the economic growth, it refers to relative decoupling. In this case, still the relationship between the economic growth and environment impact remains positive. In contrast, under absolute decoupling,

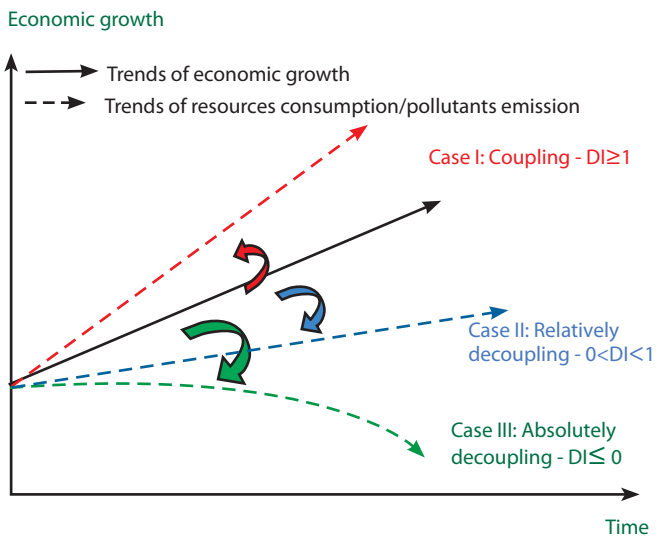
the environmental impact declines as the economy grows.

The decoupling concept can be further explained by using the Decoupling Index (DI) developed by Organisation for Economic Co-operation and Development (OECD) to depict the degree of decoupling. The index can be represented as

$$DI_t = \frac{\Delta P_t}{\Delta Y_t}$$

where, ΔP_t represents the growth in emissions in time t over t-1, while ΔY_t represents the economic growth in time t over t-1. The relationship between the economic growth and GDP can be explained based on the value taken by DI as shown by figure 4. If DI is higher than 1 (DI>1) for any positive value of ΔY_t, it means that the emissions are growing at a faster rate than GDP, thus no decoupling is taking place, i.e., the economic growth is coupled with the emissions growth. This further represents the increasing part of the slope of EKC in figure 3. The point where the DI is exactly equal to 1 (DI=1) represents the turning point from coupling to decoupling. When the DI is higher than 0 and less than one (0<DI<1) the relative decoupling is taking place since the emissions increase at a slower pace than the economic growth. At this stage, EKC curve increases at a slower pace. When the DI is less than 0 (DI<0), the absolute decoupling is taking place thus the emissions decline as the economy grows, which represents the declining part of the EKC curve.

Figure 4

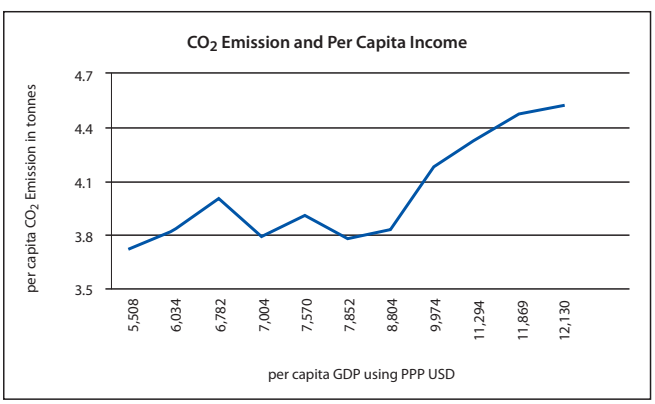


Source: Adapted from United Nations Environment Programme (UNEP), 2011, p.111

Empirical Analysis

This section examines the real world relationship between the CO_2 emissions and economic growth. Figure 5 represents the EKC curve drawn for the entire world using per capita income and per capita CO_2 emissions related data during 1971 to 2013 published by the IEA 2015. Overall trend of the curve analysed on the aspects of decoupling, highlights that the global CO_2 emissions stands on the increasing part of the EKC curve. However, towards higher GDP per capita levels, the slope of the curve increases at a slower pace unveiling that the relative decoupling is taking place.

Figure 5



Source: International Energy Agency (IEA), 2015

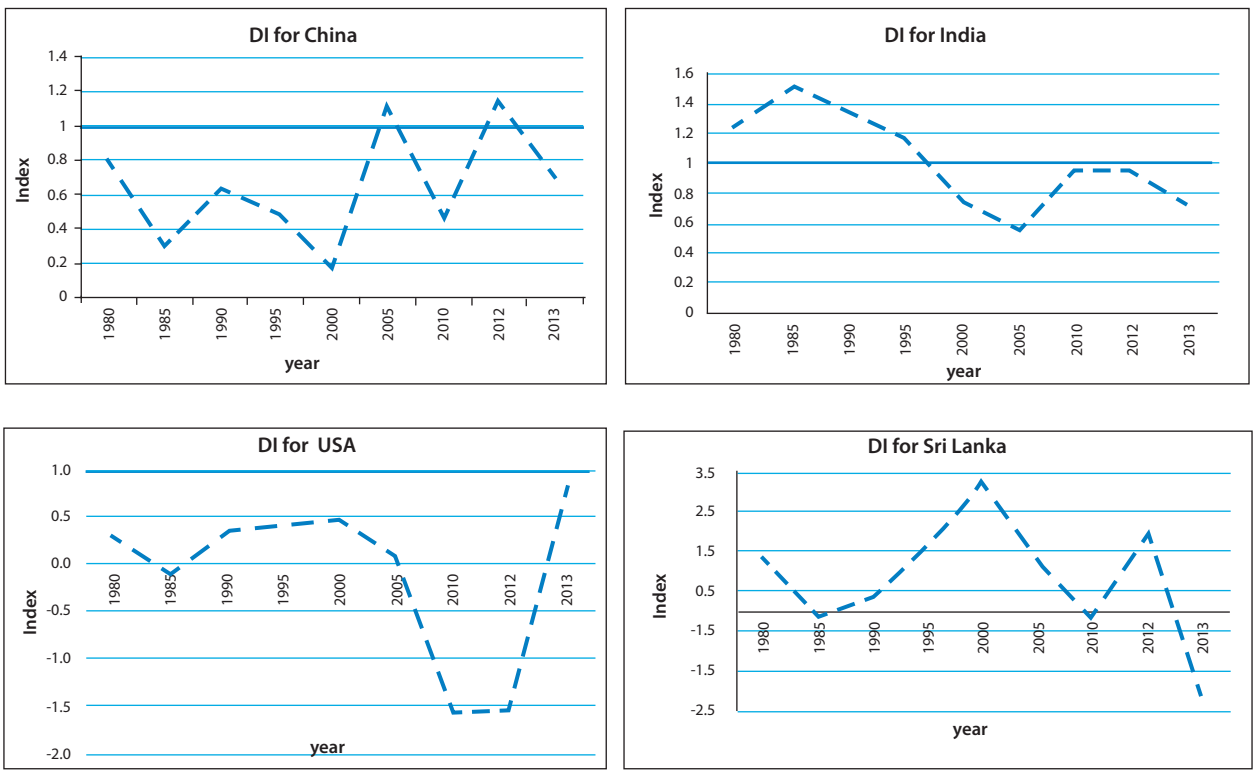
Moreover, country wise analyses were conducted to understand the relationship between the economic growth and CO_2 emissions. As revealed by the IEA 2015, the top ten emitters of CO_2 account

for one- third of the world CO_2 emissions where China, USA and India are the leading CO_2 emitters. Consequently, DIs were calculated for China, USA and India, also covering Sri Lanka, based on GDP in PPP terms and CO_2 emissions data published by the IEA 2015. The figure 6 represents the DI curves calculated for these countries.

As presented in the figure 6, DI for China, the top emitter of CO_2 accounts for around one fourth of total emissions, remains mostly between zero to one range (0<DI<1) which shows relative decoupling. However, the index shows an increasing trend after 2000 which has even led to recoupling in some years. In USA, the second leading emitter of CO_2, DI is less than zero (DI<0) starting from 2005, which shows absolute decoupling while it has moved back to relative decoupling in 2013, where as in India, a relative decoupling trend is evident after 2000 (0<DI<1).

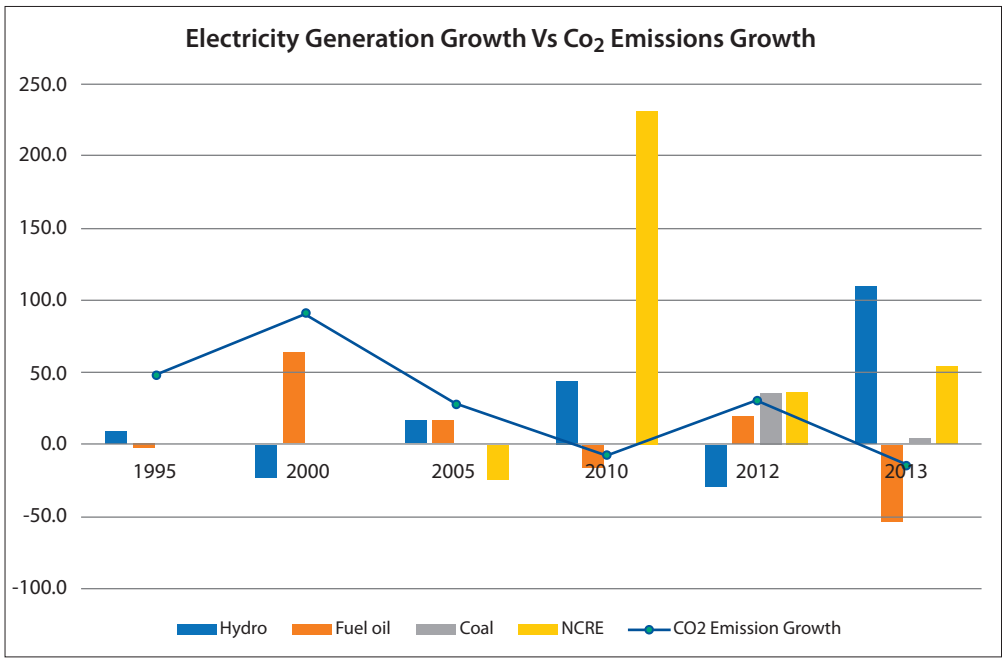
Considering the data related to Sri Lanka, emissions are mostly coupled with GDP growth. However, the emissions in magnitude are very low in Sri Lanka. In examining the energy usage for power generation in Sri Lanka (Figure 7), an increase in hydro power and nonconventional renewable energy (NCRE) usage can be observed during the periods where relative decoupling has taken place. However, it is important to examine the fuel usage for transportation sector in order to conduct a proper analysis on the energy usage and CO_2 emissions for which, lack of data is a constraint.

Figure 6



Source: International Energy Agency (IEA), 2015 and author's calculations

Figure 7



Source: Central Bank of Sri Lanka

The above analysis reveals that the leading emitters have moved towards relative decoupling. However, it is vital to take measures for absolute decoupling in China and India, being the leading emitters, in order to reduce the overall CO_2 emissions as targeted under UNFCCC agreement.

Measures for Decoupling

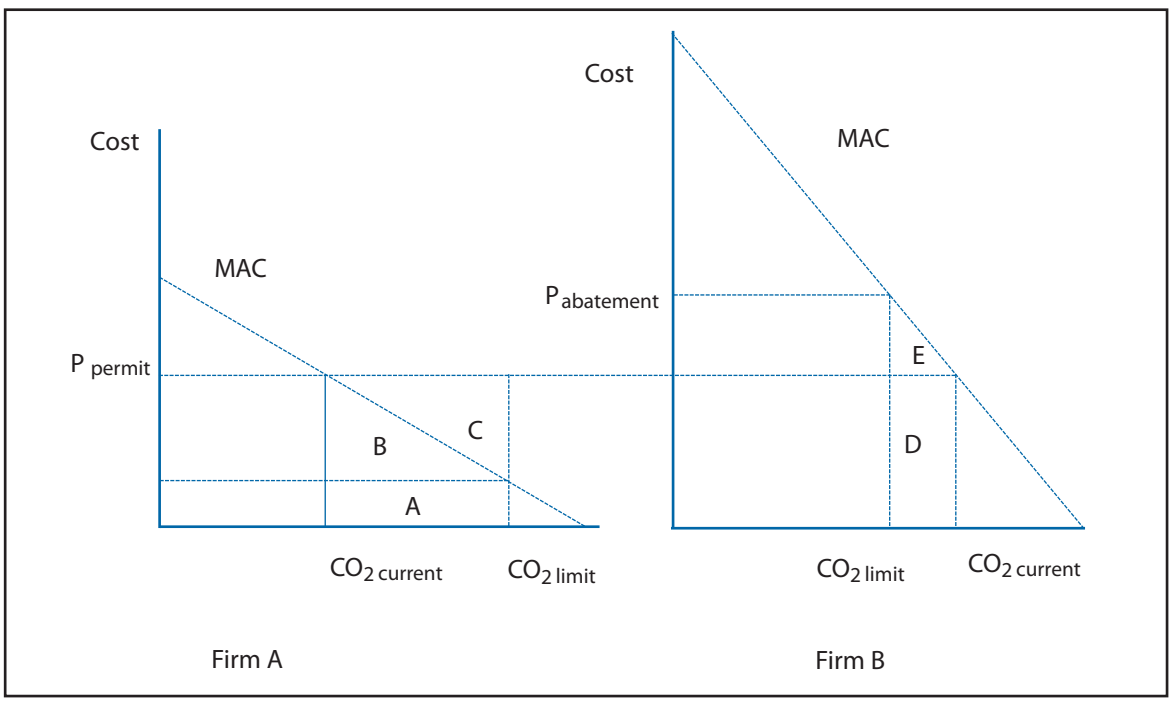
The UNFCCC, the foundation for reducing the human induced climate changes, implemented various actions to combat climate change. One of such remarkable initiative is the Kyoto Protocol adopted in 1997. The protocol required the industrial countries to reduce GHG emissions by an average of 5 per cent below 1990 levels during the first commitment period of 2008-2012. In the protocol these countries were named as Annex 1 parties[3]. The agreement was amended in 2012 introducing the second commitment period which began from 1 January 2013 and end in 2020. At the 21st session of UNFCCC, the Paris Agreement was made reaffirming the control of global temperature rise to less than 2° Celsius, above pre industrial levels. The key measures taken under Kyoto Protocol are Emissions Trading, Joint Implementation (JI) and the Clean Development Mechanism (CDM).

The first measure taken under Kyoto Protocol, Emissions Trading Scheme, is a market based strategy to meet CO_2 emissions reduction targets given under Kyoto commitment to countries listed in the Convention's Annex 1. Under the emissions trading mechanism, carbon permits are issued by the governments of Annex 1 countries to their emitters such as firms, limiting the quantity of carbon emissions in order to meet the overall target. Firms that emit beyond the permitted level have to take abatement measures to meet their individual targets, which involve abatement cost. Under emissions trading, if a firm emits carbon less than the permitted level, it can sell the balance to other companies with high abatement cost, that emit carbon beyond the permitted level. Accordingly, both parties can gain from emissions trading. This mechanism is known as cap and trade system.

3 These countries are named as Annex 1 Countries as they are listed in the Convention's Annex 1 which includes 40 countries and European community.

The example given below in figure 8 further illustrates the emission trading mechanism (cap and trade system) explained above in an economic point of view. Accordingly, there are two firms called A and B , where Marginal Abatement Cost (MAC) for firm B is higher (relatively steeper MAC curve) than that for firm A. $CO_{2\ limits}$ represents the permitted amount of emissions by the government. $CO_{2\ current}$ is the current level of emissions. For firm B, the current level of emissions is higher than the permitted level, thus the actions should be taken to reduce the emissions. However, the abatement cost for firm B at $CO_{2\ limits}$ is higher than the permit price (P_{permit}). On the other hand, for firm A, the MAC at $CO_{2\ limits}$ is lower than the $P_{permit,}$ thus firm A can take abatement measures until P_{permit} equals MAC. The balance amount of permits ($CO_{2\ current}$ to $CO_{2\ limits}$) can be sold at the price of P_{permit} to other firms with higher MAC such as firm B. The total revenue for firm A from trading permits is represented by the area of A+B+C while the total abatement cost is B+A. Thus, firm A can have a net gain of C through carbon trading. Conversely, firm B has to bear a cost equal to area D+E in order to maintain the emissions at permitted level. Instead, firm B can purchase permits (amount of $CO_{2\ limit}$ to $CO_{2\ current}$) from A and continue to emit at $CO_{2\ current}$. The emissions trading limits the total cost for firm B to area D thereby generating a saving equal to area E. Consequently, both parties gain from emissions trading while the overall emissions are maintained as targeted by the government. Emissions Trading Scheme (ETS) developed under this has made the emissions permit an internationally tradable commodity. The European Union Emissions Trading System is one of such successful emissions trading schemes which play a major role in European Union climate policy mechanism.

Figure 8: Emissions Trading



Source: Author ,Using Existing Theories

The second strategy introduced under Kyoto Protocol, JI programme, is a mechanism to promote investments on green development among Annex 1 countries. Accordingly, an Annex 1 country can do

investments among Annex 1 countries on emissions reduction projects. The estimated amount of emissions reduced due to the project is added to the permitted emissions for investing country and deducted from the permitted emissions for host country.

In addition, the CDM under Kyoto Protocol was established to extend the mechanism introduced under JI to the developing countries. Under CDM, Annex 1 countries can invest in emission-reduction projects such as renewable energy projects in developing countries, thus help sustainable development in developing countries, as well. In return, Annex 1 countries earn Certified Emissions Reduction (CER) credits, which help Annex 1 countries to achieve their compliance. Sri Lanka has been identified as a potential place to invest in CDM projects, especially, in the sectors related to Energy, Industry, Transport, Waste management, Agriculture, Forest management, and Plantations. However, only hydropower and wind power projects have been carried out so far in Sri Lanka such as Kithulgala and Kirkoswald Small Scale Hydropower Project and 10.5MW PowerGen Lanka Small Scale Wind Power CDM Project under CDM programme. Therefore, it is worthwhile for Sri Lanka to attract CDM projects to achieve sustainable development by getting financial and technical support from developed countries.

There are some other measures developed to reduce carbon emissions in addition to the mechanisms developed under Kyoto protocol. One of such approaches is the taxation where a tax is imposed on each unit of emission. Australia and Sweden are examples for countries that have implemented such a taxation system. Carbon tax is easy to implement and involves less administrative effort compared to cap and trade. Further, under the taxation system, price of carbon is certain as it is determined by a government. However, it provides no ceiling on the level of emissions. In contrast, the cap and trade system provides certainty on emissions as it imposes a ceiling on overall emissions while the price can vary as it is determined by the market.

Countries all over the world have taken various measures in moving towards a low carbon environment such as promoting renewable energy usage, waste management, encouraging innovations to improve energy efficiency, enhancing public awareness and imposing regulations.

Some countries are keen on promoting renewable energy usage. For example, Australia has a target of generating around 20 per cent of total electricity demand using renewable energy by 2020. The country has introduced a tradable certificate scheme to legislate the demand for renewable energy which in turn promotes investments on renewable energy projects. Accordingly, retail and wholesale electricity purchasers are required to surrender a certain amount of certificates which can be traded for cash. The system has promoted both large scale projects such as wind power and hydropower as well as small scale projects such as solar energy generation projects for households.

Waste management and generating biomass energy is also a key measure to reduce emissions. For instance, in Australia, bioenergy sourced mainly from sugar cane residue, wood waste, and capture of gas from landfill and sewage facilities accounted for 78 per cent of the renewable energy use in 2007–08 as per Australian Energy Resource Assessment (AERA 2013).

Innovations also play a central role in carbon management. Using new technologies to reduce carbon emissions has been encouraged under carbon trading schemes as well. Automobile industry is one such key area that has developed with innovations. Bio-mimicry, which examines the

nature in developing innovations to make solutions for human related problems, is also considered as an important aspect in reducing carbon emissions. For example, there are some innovations on converting CO_2 into green gasoline using a plastic tree which soaks up more carbon than natural trees.

Educating the general public and imposing regulations are of utmost importance in introducing emission control standards. Lack of knowledge on the impact of human action on environment is an obstacle in moving towards a green environment. There is evidence even in developed countries which shows the knowledge gap of the general public about the environmental aspects[4]. In this regard, governments have to play a central role in educating the general public on consequences of carbon emissions and the responsibility of the general public in reducing emissions. Some countries encourage the producers to display the amount of GHG emitted to the atmosphere due to their products, which is known as the carbon foot print of the product, in the packing so that the consumer can make informed decisions in using such products.

Governments have imposed direct regulatory controls to reduce emissions. Some countries do not allow private vehicles to enter the city areas during peak hours and have developed systems for the convenience of the passengers. Especially, Brazil has developed a bicycle-sharing system called Bike Rio in the city of Rio de Janeiro. Accordingly, passengers can park their private vehicles in the city boundary and hire a bicycle to enter the city area. Australia also has taken measures to promote bicycle usage through advertising campaigns. Such policies reduce not only emissions, but also the traffic congestion. However, it is necessary to improve public transportation system and road network for effective implementation of such policies.

The Sri Lankan Context

Sri Lanka has also been highly exposed to climate change related consequences at present. In recent years, Sri Lanka has badly been hit by the extreme weather conditions such as floods, landslides and drought. Even though the total emissions in Sri Lanka are low in magnitude, the emissions are mostly coupled with the economic growth as illustrated in the previous section of this article, thus it is beneficial to move for decoupling measures to achieve a sustainable growth. Accordingly, Sri Lanka also has taken some initiatives to face the challenge of combating climate change by actively involving in UNFCC mechanism for sustainable growth. In this regard, a National Climate Change Policy has been introduced by the Climate Change Secretariat of the Ministry of Mahaweli Development and Environment to battle climate change related issues and to adopt suitable measures. At present, the government has paid increased attention to reduce carbon emissions. Accordingly, measures have been initiated promoting the use of clean energy such as introducing concessionary loan schemes for solar panel installation. Further, policies have been introduced to promote novel technologies such as Nano Technology to improve energy efficiency and to encourage the use of wind energy and biomass. At the same time, initial steps have been taken to establish a proper waste management system.

However, being a country in its developing stage, it is a challenging task maintaining the growth path while reducing its adverse impact on the environment. In this context, Sri Lanka

4 For example, John O'Brien, a managing director of Australian Clean-tech, mentions in one of his publications that he was asked several times whether he would be cleaning carpets or curtains while promoting clean tech in Australia in 2007.

has lessons to learn from the other countries that practiced various measures as detailed above to control CO_2 emissions. Especially, the country can benefit from CDM projects which provide both technical knowhow and financial support to reduce CO_2 emissions while maintaining the growth momentum. Further, improving public awareness and regulatory controls are required. Public awareness campaigns on climate change and consequences would enhance the general public concern about the nature. Advertising and promotional campaigns to encourage products with low carbon footprints such as local handicraft would reduce the use of polyethylene and plastic. Further, a proper system is required to be introduced for waste management while a fine system for litter pollution needs to be effective. Transport sector developments are also important to move to a low energy consuming environment. Developing public transport system and road safety will enable to reduce the use of personal vehicles. Promoting energy efficient vehicles should also be considered. These measures will in turn save the foreign exchange spent for energy generation in the long run.

In conclusion, emissions reduction measures taken all over the world have contributed to achieving relative decoupling. However, continuous commitment and further measures are of paramount importance to move towards absolute decoupling in order to reduce carbon emissions as targeted. Improving efficient use of resources and promoting clean energy are vital in this regard.

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Credit Default Swaps

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Introduction

A rapid rise in the use of credit default swaps (CDS) was prominent in the market during preceding financial turmoil as the financial crises have shifted the focus of public debate onto the risks management. This product CDS, has been introduced to the market in 1997 by JPMorgan and grew very rapidly after 2000. By the end of year 2007 the notional value[1] of the CDS market reached its peak level with a value of USD 60 trillion. However, this volume has deteriorated to a notional value of USD 19.4 trillion by now reflecting the intensified effort created to reduce the counterparty credit risk.

What is CDS and how it works

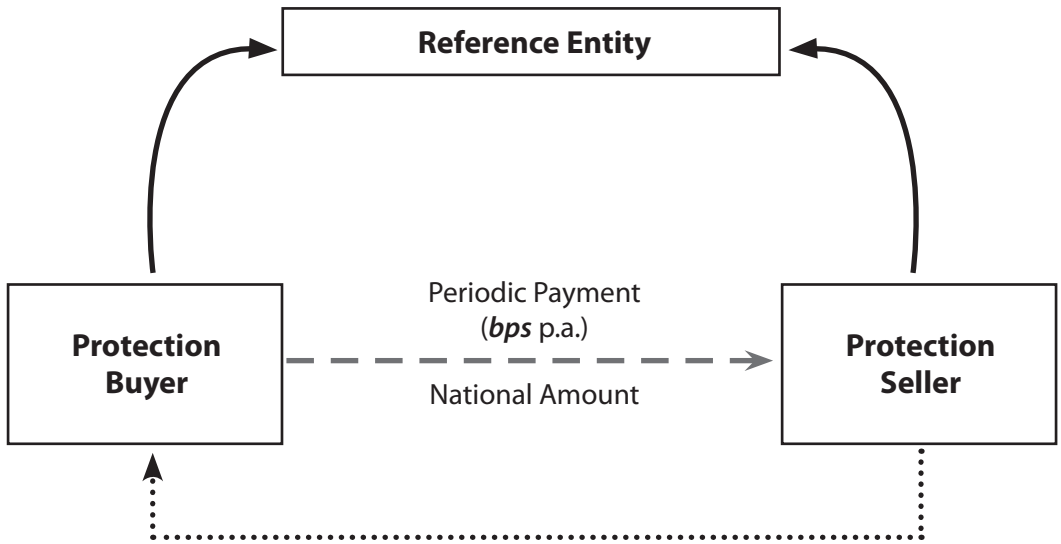
A CDS resembles an insurance policy, where one side assumes the risk and the other pays an insurance premium. Therefore, theoretically, a CDS is a contractual agreement that transfers the default risk of one or more reference entities[2] from one to the other. During the term of the CDS, one party, the protection buyer, pays a periodic fee or a premium to the other party, the protection seller. This premium is, quoted in basis point or in a percentage point of the notional and called the CDS spread. If the reference entity defaults or declares bankruptcy or another credit event[3] occurs, the protection seller is obliged to compensate the protection buyer for the loss by means of a specified settlement procedure. Figure 1 shows how CDS work in the market. Upon occurrence of a credit event, the settlement of the CDS contract can be either in physical or cash. In the past, mostly the credit events were settled with physical settlement in which

1 As per the ISDA definitions, Notional value refers to the par amount of credit protection bought or sold equivalent to debt or bond amounts and is used to derive the premium payment calculations for each payment period and the recovery amounts in the event of a default.

2 Reference entity is the party upon which the two counterparties in the transactions are speculating.

3 Credit events are the events that cause the buyer of protection to terminate and settle the contract and are agreed upon at the time the trade is entered into and are part of the contract.

Figure 1



the seller of the protection pays the buyer par value, and in return receives the bond or the reference asset of the reference entity. However, to be successful of such contract, CDS contract buyer should actually hold the underlying asset or the bond.

On the other hand, Cash settlement was introduced to overcome the practical issues with physical delivery and work more efficiently in settling the contract when credit event occurs. There the protection seller pays the buyer the difference between par value and the market price of the reference asset.

Types of CDS contracts

CDS are of two types namely Single name CDS and Multi name CDS. Single name CDS is a contract where the reference entity is a single name and the Multi name CDS is a contract where the reference entity is more than one name as in basket CDS or CDS indices. Index CDS are similar to other financial indices which track the prices of group of underlying CDSs that constitute the index and more standardized and liquid than other credit default swaps. Hence, this multi name contracts have become more popular though single name contracts are considered to be widely used. According to the Bank for International Settlement (BIS) survey in June 2014, single name CDS contracts constitute 56 percent of the total notional outstanding and multi name contracts account for 44 percent of the notional outstanding.

Users of the CDS Market

CDS were widely used by investors to minimize the credit risk associated with its reference entity or the reference portfolio rather than to insure against bad debt. Commercial banks were the major players of the credit default swaps as, under the prevailed regulation, using a CDS meant that a bank could decrease the amount of capital it was required to hold in reserves against its loans which results in freeing money for the bank to use for other purposes. Highly rated dealers, insurance companies and financial guarantors are the typical protection sellers of the market. According to the BIS, as of June 2014 reporting dealers[4] accounted for 49 percent of CDS notional outstanding whereas other financial institutions like central counterparties, banks and security firms, hedge funds etc. were 50 percent of the notional holdings.

4 Those whose head offices are located in the G10 countries and which participate in the BIS semiannual derivatives market statistics.

Uses of CDS

At the primitive stage of the CDS market, it was primarily used for hedging purposes and gradually it has been used by the investors for speculation and arbitrage purposes as new trading instrument.

CDS as a hedging tool is widely being used to manage the credit risk arising from holding debts or a bond. By entering into a CDS contract, a holder of the bond may hedge his exposure and if the bond goes into default, the proceeds he receive will offset the losses incurred on the bond holding.

The speculation allows investors to speculate on changes in an entity's credit quality as the CDS spreads increase with the decline of credit worthiness and decrease with credit worthiness increases. Therefore, an investor may buy CDS protection on an entity in order to speculate that entity is about to default and sell the protection if he thinks that the entity is not going to default.

However, with the development of the CDS market, they were used widely for speculation than the hedging tool. This is proved having CDS contracts written much larger than the physical bonds. This has led for an environment of having more cash settlement than the physical settlement.

Furthermore, the CDS is used for capital structure arbitrage in case the stocks values drop drastically in the market. This technique further emphasis that an entity's stock price and its CDS spread should exhibit a negative correlation. For an example share price of a company will go up with the improvement of its profile and thereby the CDS spread will be tighten since the likelihood of the default by the company is lesser. Also, in a case of a drop in the share price the spread of the CDS will be wider. This is known as capital structure arbitrage as it exploits the market inefficiencies between pricing of debt and equity.

Regulations relating to CDS

In 2008, there was no centralized exchange or clearing house for CDS market since all transactions were carried out over the counter (OTC). However, with the incidents occurred during the financial turmoil of 2008, it drew considerable attention on the regulation over CDS.

Also, the growth of speculative CDS than the value of underlying written much larger than physical bonds has led for enactment of new regulation in the CDS market as it has amplified the risk of market. This has been mainly as a result of a naked swap in which the holder does not have any interest in the underlying reference entity though he uses the CDS as an instrument to speculate.

Further, as many CDS contracts are settled through Cash and hence, the defaults by seller of protection have increased more, these OTC derivative transaction need special scrutiny and attention towards developing a robust regulation system to achieve greater transparency, preventing frauds, insider trading and other abuses in the market.

Consequently, latter part of the year 2008, Depository Trust and Clearing Corporation (DTCC) who runs a warehouse for CDS trade confirmations agreed to release market data on the notional outstanding on a weekly basis. As a result, in April 2009, CDS market participants agreed to standardize the terms of CDS contracts, which would make them easier to clear through a central counterparty that takes on each party's risk of default[5].

Also, according to the Consultation report published by the Board of International Organization of Securities Commission (IOSCO) [6] on the Post trade transparency in the Credit Default Swaps Market as

5 Markit, The CDS Big Bang; Understanding the Changes to the Global CDS contract and North American Conventions March 2009.

of November 2014 , few IOSCO member jurisdictions have legislative and regulatory frameworks in place that require post trade public dissemination of the price and volume of CDS transactions. Accordingly, the United States and Japan has their legislative frameworks in effect already whereas Canada and European Union have adapted mandatory post trade transparency framework that are expected to take effect in the near term. In addition, market participants have already begun to clear CDS contracts through clearing houses operated in the United States and Europe and willing to expand CDS clearing overtime.

Role of Central Counterparty Clearing in Credit Default Swaps

A Central Counterparty (CCP) is an institution that exists as an intermediary to carry out clearing and settlement in a financial transaction. According to the Institution for Swap and Derivative Association (ISDA), CCP's primary goal is to reduce the risk within the market standing between counterparties. CCP is considered to be stronger or more credit worthy than the parties to the transactions and articulate clearing service to both single name CDS and CDS index trades.

The use of CCPs is enhanced with the intention of strengthening the counterparty risk management as counterparty credit risk represents a major aspect of all privately negotiated derivatives including CDS. This will reduce and manage the credit risk by analyzing on the credit worthiness negating the need of carrying out credit assessments and investigations by individual counterparties. In carrying out such independent credit assessment, CCP gets down the financial statements, tax forms, bank statements, past credit history or any other necessary documents and information of each member or client. Also, it reduces and manages the credit risk by analyzing on the credit worthiness negating the need of carrying out credit assessments and investigations by individual counterparties. CCP will set the minimum required standards like maintaining a minimum capital base, income generating ability etc. to do business with them.

Both parties to the transaction are required to send details of the trade to the CCP , once a trade is done and agreed to clear through the CCP, while the buyer should send the cash if required. Then the CCP will transfer this money to the seller of the CDS. In the meantime, CCP would monitor the trade over a period and on daily basis, do the marked to market to identify the margin requirement to cover the loss by either party.

If the party defaults posting the required margin CCP will take the necessary actions according to the terms and try to recover the loss or to prevent further deals by that party. CCP has its capital base comprising of initial capital contribution from the founding members or a part of the fee they collected from the participants at the times of trading. Therefore, the capital fund can be used partly to cover the loss arising from the bankrupt party.

However, there are some instances where CDS markets significantly move up or down resulting in greater margin calls from members and members are unable to pay the due. In such cases, clearing house bears the responsibility to make the total dues from its capital creating another crisis in the market if its capital is not adequate enough. Also, requirement of higher margins reduce the liquidity on the clearing house making it more favorable to deal amongst them.

Benefits of CDS

An effective mean for hedging the Credit Risk

Being a protection buyer of the CDS is an effective mean for hedging the credit risks as it allows financial institutions to effective management of their exposures on balance sheet assets such as corporate bonds. Therefore, CDS can be used as a better mean for risk transferring and sharing as it helps to distribute the risk widely throughout the system preventing

6 IOSCO is the international body that brings together the World's securities regulator and is recognized as the global standard setter for the securities sector.

large concentration risk that otherwise would occur.

Providing a market based assessment of credit worthiness of an entity

CDS, as a trading instrument allows investors to speculate on changes in CDS spreads where investor believes that an entity's CDS spread is too high relative the bond yields and attempt to make a profit being a protection seller in the CDS market. Finally, the CDS provide a market based assessment of credit condition of an entity since the investor will speculate on an entity's credit quality as CDS spreads will, increase as credit worthiness declines and decrease as credit worthiness increases.

Price discovery in the credit market

Speculators and arbitrages, improve the liquidly in the derivative market being actively involved in the market and would enhance the pricing inefficiencies in the market producing better and more timely information. Therefore, this gives an incentive to market players in effective asset allocation. For an example if speculators anticipate an increase in demand resulting in a price increase for a CDS, he would buy the CDS now to make a gain in the future by selling it back.

Drawback of CDS

Reducing the confidence in the entity creating problems in the market

CDS market plays an informational role in the market as change in CDS spreads signals on the credit quality and the creditworthiness of the reference entity or the reference assets. Accordingly, widening of an entity's CDS spread reduces the confidence in the entity creating problems which cannot be overcome. According to the market view, this has caused the Lehman Brother to lose the trust from the market and go bankruptcy in 2008.

Exposure to the counterparty credit risk

As with the other OTC derivatives, CDS are also exposed to counterparty risk. This risk will be much larger in a case where both the protection seller and the underlying entity default together. This would exist if the protection seller does not have sufficient reserves or liquidity to cover up the due CDS payments. Hence, the concentration of the CDS market on a few dealers amplifies the counterparty risk exposure in greater manner affecting many market participants.

Creating financial instability and generating systematic risk

CDS contracts have been blamed for creating financial instability and generating systematic risk. This is because; the default of an entity entails losses to both its counterparties and protection sellers in credit default swaps. A default of the protection seller takes place if it does not possess the adequate level of money to settle the dues in the market. This on the other hand will lead to a default contagion and systematic risk.

Conclusion

Growth of CDS market has facilitated investors to minimize the credit risk associated with its counterparts while creating opportunities for investors to speculate on changes in CDS spread providing a valuable market base assessment on credit conditions.

On the other hand, like other derivative contracts, CDS contracts also play a part in market manipulation and have been blamed for creating financial instability and systematic risk. However, use of CCPs contributes significantly to financial stability by enhancing the resilience of the OTC market and to reduce the counterparty credit risk.

Rebasing and Improving the National Accounts Estimates of Sri Lanka

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Assistant Director
Statistics Department

The Department of Census and Statistics (DCS) rebased the National Accounts estimates of Sri Lanka from 2002 to 2010 while introducing methodological enhancements to the compilation procedures in order to provide a more accurate and up-to-date depiction of the economy[1]. Rebasing helps policy makers to understand the current situation of economic activities and to channel policies and resources in an optimal manner to stimulate the economy. National accounts estimates produce valuable set of economic indicators such as gross domestic product (GDP), gross national income (GNI), savings, investment, disposable income etc. Among those indicators, GDP is the most frequently used estimate which measures the overall size of an economy. In general, GDP is known as the final value of the goods and services produced within the boundaries of an economy during a specified period of time. GDP can be derived from three aspects, commonly known as production, expenditure and income approaches. In production front, GDP is derived from the concept of gross value added. Gross value added is the difference between output and intermediate consumption. GDP is the sum of gross value added of all resident producer units plus net taxes on products that are not included in the valuation of output. In other words, this GDP is equal to the sum of the final uses of goods and services (that is final consumption and investment) within the economy plus the value of net exports of goods and services, which is commonly known as expenditure front GDP estimate. Moreover, this estimate is also equal to the sum of primary incomes[2] distributed by resident producer units, which is the income approach estimate.

The notable changes to the National Accounts compilation process included adhering to the System of National Accounts[3] (SNA 2008) guidelines to the maximum possible level, broadening the coverage of GDP, presenting GDP under the institutional sector classification, adopting internationally recommended economic classifications, incorporating wide range

1. CBSL published useful box articles on "National Accounts Compilation" – Page 60, CBSL Annual Report 2013 and "Upgrading the National Accounts Compilation Process in Sri Lanka" page 31, CBSL Annual Report – 2014.
2. Primary incomes are incomes that accrue to institutional units as a consequence of their involvement in processes of production or ownership of assets that may be needed for purposes of production (SNA 2008).
3. The System of National Accounts, 2008 (SNA 2008) is a statistical framework that provides a comprehensive, consistent and flexible set of macroeconomic accounts for policymaking, analysis and research purposes. It has been produced and is released under the auspices of the United Nations, the European Commission, the Organisation for Economic Co-operation and Development, the International Monetary Fund and the World Bank Group. (SNA 2008 published in 2009).

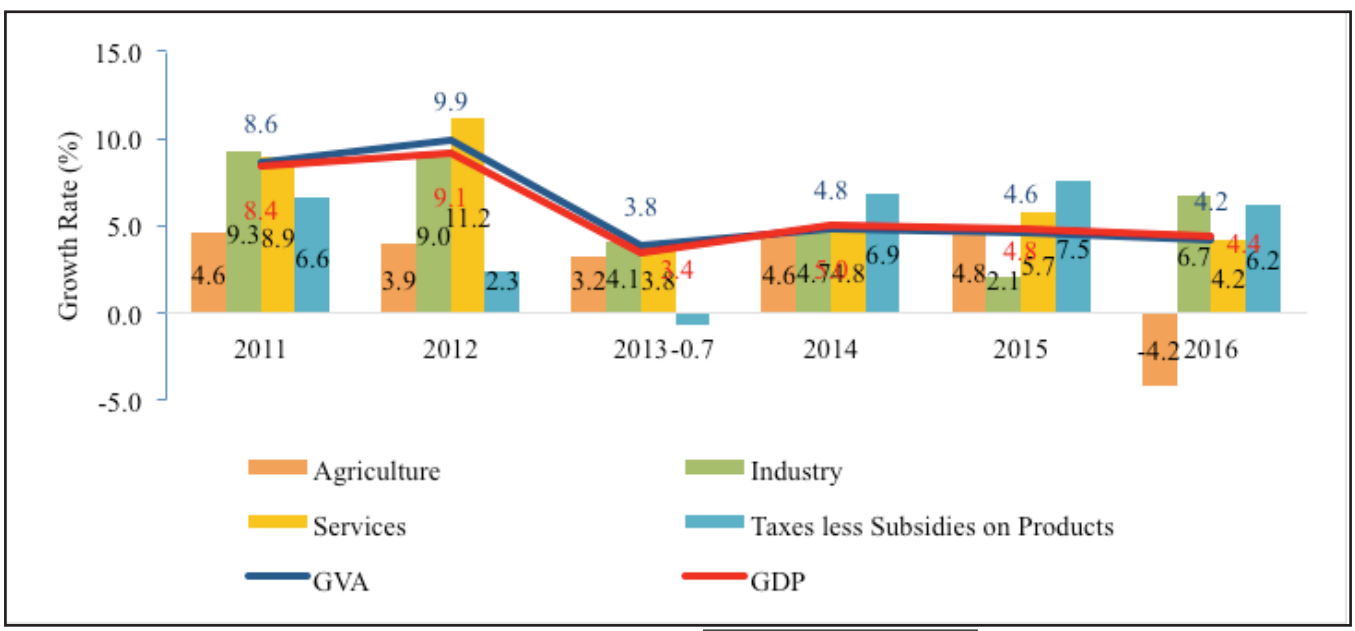
of new data sources to the compilation process etc. Moreover, in line with the rebasing exercise the DCS introduced a standard revision policy where published annual and quarterly estimates are subject to revision for a span of 3 years.

Notable Developments in the Rebasing Exercise

The classification of economic activities in the production estimates of the new series was based on Sri Lanka Standard Industry Classification (SLSIC)[4], a locally adopted version of International Standard Industrial Classification (ISIC) revision 4 of the United Nations Organisation. Thus, new activities such as professional services, IT programming, consultancy activities, programming and broadcasting activities, sewerage, waste treatment and disposal activities, plant propagation and agricultural supporting activities, and work in progress in agriculture related activities were introduced in the compilation process. Moreover, activities which were not adequately covered in the previous series such as production activities of households, private education, private health services, legal services, architectural services, beauty culture services etc. were captured as far as practically possible in the new series. The household economic activities were covered to a large extent through the Labour Input Method, which uses Labour Force Survey statistics to estimate the unobserved activities in the household sector. In brief, this method computes gross value added per worker of a certain category of an economic activity that has sufficient information and inferred on other categories which do not have adequate information to compute the value added, yet have information on labour participation.

As recommended by the SNA 2008, the DCS now follows the integrated sequence of accounts in compiling National Accounts estimates. In the production approach estimates, basic price[5] concept was introduced in estimating the gross value added of an economic activity and finally the taxes less subsidies on products of the economy was adjusted to the total gross value added in order to estimate the GDP. When considering the composition of GDP in 2016, the services activities mainly contributed to the Sri

Figure 1: GDP growth – 2010 Constant prices



4. The SLSIC classification can be accessed via http://www.statistics.gov.lk/industry/SLSIC.pdf.

5. The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, by the producer as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer. (SNA 2008).

Table 1: Average Gross Value Added Shares of the Institutional Sectors (current prices): 2010-2016

Activity	NFC	FC	GG	HH & NPISHs	Total Economy
Agriculture	17.3	-	-	82.7	100.0
Industries	61.7	-	2.7	35.7	100.0
Services	24.3	7.5	14.6	53.6	100.0
Gross Value Added	35.1	4.6	9.7	50.7	100.0

Source: Department of Census and Statistics

Lankan economy accounting for around 56%, followed by industry with 27%, taxes less subsidies on products with 10% and agriculture with 7%. Another notable improvement was the introduction of advanced treatments such as financial intermediation services indirectly measured (FISIM) were incorporated in the computation of gross value added in financial services under the new estimation procedure. Moreover, as recommended in SNA 2008 the gross value added of each economic activity is further disaggregated into their institutional sector classification.

Introduction of the institutional sector classification was a key feature of the rebased series. The value added of each economic activity was further classified into its respective sectoral contribution of Non-Financial Corporations (NFC), Financial Corporations (FC), General Government (GG) separately, while both Households (HH) and Non-Profit Institutions Serving Households (NPISH) were considered as a single sector in the compilation process.

The HH & NPISH sector has been the major contributor, representing more than half of the gross value added during 2010-16 period. This prominence was clearly visible in the agriculture as well as services activities. Such notable contribution was mainly due to the inclusion of the production of goods or services by the household unincorporated market enterprises[6] ranging from single persons working as street traders or shoe cleaners with virtually no capital or premises of their own to large manufacturing, construction or service enterprises with many employees in the HH & NPISH sector. NFC was the second largest sector comprising approximately 35% of the economy, largely supported by the Industrial activities. The GG sector contribution was mainly in the Services activities concentrating in the areas of public administration, defence and compulsory social security, education and health activities.

Under the new expenditure approach estimates, the estimation horizon was broadened by introducing the net acquisition of valuables of the economy, the capital formation of information and communication technology equipment, cultivated biological resources, intellectual property products, and weapons systems to the compilation process. Moreover, the government final consumption expenditure has been further classified to the collective consumption expenditure (expenditure categories such as defence, public order and safety, general public services etc.) and individual consumption expenditure categories (expenditure categories of health and education). The household final consumption expenditure was detailed under the Classification of Individual Consumption by Purpose (COICOP) and the government final consumption expenditure was detailed under the Classification of the Functions of Government (COFOG), providing additional information.

The DCS had simultaneously published the detailed current and constant annual estimates of National Accounts under the income approach for 2010-2016. The estimates were classified according to its income generation categories, which are compensation of employees (CE) which represents the income of individuals in return for their labour input into production processes, gross operating surplus

6. An unincorporated enterprise can only be treated as a corporation if it is possible to separate all assets, including financial assets down to the level of cash, into those that belong to the household in its capacity as a consumer from those belonging to the household in its capacity as a producer (SNA 2008).

(GOS) which represents the income generated from factors of production other than labour that can be separately identifiable, and taxes less subsidies on both production and products. Here, GOS was the major contributor to the income generated in the economy followed by the CE. GOS comprises of Net Operating Surplus (NOS), Mixed Income (MI) and Consumption of Fixed Capital (CFC). CFC signifies the decline in value of the fixed capital used in a production process during the period considered. The MI is the income generated by household sector by utilising household labour in the production process. Further, detailed tables were provided disaggregating each income generating component in gross value added into the sectors of the economy namely, NFC, FC, GG and HH&NPISH. Here, HH&NPISH sector was the major contributor to the income generation of the economy due to its significant share in CE and GOS components.

Table 2: Average Sector Share of the Gross Value Added (current prices): 2010-2016

Component	NFC	FC	GG	HH & NPISHs	Total Economy
Compensation of Employees (CE)	31.9	5.5	28.3	34.4	100.0
Gross Operating Surplus (GOS)	34.4	4.1	2.1	59.3	100.0
Net Operating Surplus (NOS, net)	38.0	4.9	1.1	56.0	100.0
Mixed Income (MI)	-	-	-	100.0	100.0
Consumption of Fixed capital (CFC)	39.9	2.5	11.6	45.9	100.0
Other Taxes less Subsidies on Production	92.7	7.0	-	0.2	100.0
Equals Gross Value Added (GVA), at basic price	**33.9**	**4.6**	**9.7**	**51.8**	**100.0**
Taxes less Subsidies on Products	-	-	-	-	100.0
Equals Gross Domestic Product (GDP) at market price	-	-	-	-	100.0

Source: Department of Census and Statistics

Way forward

Upgrading the National Accounts compilation process of a country is an ongoing process. The United Nations' Statistical Commission recommends countries to rebase National Accounts every 5 years to ensure that those statistics present the most accurate reflection of the economy as possible. Currently, the DCS is planning to change the base year again to 2015 together with some methodological improvements which would enhance the existing National Accounts estimation process. It is a responsibility of all the citizens of the country to assist this process and provide precise information in a timely manner in order to achieve true and accurate National Accounts estimates which is mutually beneficial for everyone.

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The Economic History Museum of Sri Lanka

The Economic History Museum (EHM) of Sri Lanka is an educational and public awareness initiative by the Central Bank of Sri Lanka (CBSL) which was established to provide historical information about Sri Lanka's remarkable economic journey, including present day information.

Currently the EHM is home to the Currency Museum which displays a range of exhibits starting from the evolution of currency in the world, the Sri Lankan usage dating back to the 3rd Century BC, to currency notes and coins as used in the modern day. Coins used during various eras of the country such as Anuradhapura, Polonnaruwa, a large collection of currency from the British colonial period and notes and coins issued by the CBSL since its establishment are on display. Special exhibits displaying the process of minting coins and printing currency notes are also on display. Students and the public visiting the museum are able to use tools to detect the security features of currency notes. They are able to watch videos on currency as well. The EHM offers tours to school children and interested parties free of charge. The publications sales counter providing CBSL Publications to the public is open Monday to Friday (except Public and Bank holidays) from 9.00 a.m. to 5.00 p.m.

For information contact:

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NOTICE TO THE PUBLIC

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இலங்கை மத்திய வங்கி
CENTRAL BANK OF SRI LANKA

Protect your hard - earned money from unlawful investment schemes

- The public is advised to stay away from investments in prohibited schemes and persons taking deposits without approval.
- They solicit your funds in various methods and promise you very high returns or income in various forms.

What is an unauthorised deposit?

- Funds accepted without the approval.
- Institutions or persons accepting such deposits offer you very high interest and various benefits.
- A large number of such deposit takers, have collapsed in the past and depositors have lost their money.

What is a prohibited scheme ?

- A scheme participated by persons contributing or paying a certain amount of money where benefits to their participants are largely dependent on:
  - an increase in the number of participants in the scheme, or
  - an increase in the contributions made by the participants.
- Various structures or methods are used to attract and expand the number of participants. These easily mislead you and encourage you for high returns on your contribution.
- These schemes may collapse sooner or later and you will lose your money.

Accepting deposits without approval and participation & conduct of prohibited schemes are illegal.

Institutions Licensed by the Central Bank of Sri Lanka to take Deposits from the Public (as at 01.01.2016)

Licensed Commercial Banks

1. Amana Bank PLC
2. Axis Bank Ltd.
3. Bank of Ceylon
4. Cargills Bank Ltd.
5. Citibank, N.A.
6. Commercial Bank of Ceylon PLC
7. Deutsche Bank AG
8. DFCC Bank PLC
9. Habib Bank Ltd.
10. Hatton National Bank PLC
11. ICICI Bank Ltd.
12. Indian Bank
13. Indian Overseas Bank
14. MCB Bank Ltd.
15. National Development Bank PLC
16. Nations Trust Bank PLC
17. Pan Asia Banking Corporation PLC
18. People's Bank
19. Public Bank Berhad
20. Sampath Bank PLC
21. Seylan Bank PLC
22. Standard Chartered Bank
23. State Bank of India
24. The Hongkong & Shanghai Banking Corporation Ltd.
25. Union Bank of Colombo PLC

Licensed Specialised Banks

1. Housing Development Finance Corporation Bank of Sri Lanka
2. Lankaputhra Development Bank Ltd.
3. National Savings Bank
4. Pradeshiya Sanwardhana Bank
5. Sanasa Development Bank PLC
6. Sri Lanka Savings Bank Ltd.
7. State Mortgage and Investment Bank

Licensed Finance Companies

1. Abans Finance PLC
2. Alliance Finance Co. PLC
3. AMW Capital Leasing and Finance PLC
4. Arpico Finance Co. PLC
5. Asia Asset Finance PLC
6. Associated Motor Finance Co. PLC
7. Bimputh Finance PLC
8. BRAC Lanka Finance PLC
9. Central Finance Co. PLC
10. Central Investments and Finance PLC*
11. Chilaw Finance PLC
12. Citizens Development Business Finance PLC
13. City Finance Corporation Ltd.
14. Colombo Trust Finance PLC
15. Commercial Credit and Finance PLC
16. Commercial Leasing and Finance PLC
17. ETI Finance Ltd.
18. George Steuart Finance PLC
19. HNB Grameen Finance Ltd.
20. Ideal Finance Ltd.
21. Kanrich Finance Ltd.
22. LB Finance PLC
23. LOLC Finance PLC
24. Melsta Regal Finance Ltd.
25. Mercantile Investments and Finance PLC
26. Merchant Bank of Sri Lanka & Finance PLC
27. Multi Finance PLC
28. Nation Lanka Finance PLC
29. Orient Finance PLC
30. People's Leasing & Finance PLC
31. People's Merchant Finance PLC**
32. Richard Pieris Finance Ltd.
33. Sarvodaya Development Finance Ltd.
34. Senkadagala Finance PLC
35. Serendib Finance Ltd.
36. Singer Finance (Lanka) PLC
37. Sinhaputhra Finance PLC
38. Siyapatha Finance PLC
39. Softlogic Finance PLC
40. Swarnamahal Financial Services PLC
41. The Finance Co. PLC
42. The Standard Credit Finance Ltd.
43. TKS Finance Ltd.
44. Trade Finance & Investments PLC
45. UB Finance Co. Ltd
46. Vallibel Finance PLC

* Managed by the managing agent appointed by the Central Bank of Sri Lanka. In the mean time deposit mobilisation has been suspended.

**Managed by the managing agent appointed by the Central Bank of Sri Lanka.

Keep in Mind...

- The Central Bank regulates and supervise the above named institutions under the relevant laws to promote prudence in their business operations and thereby safeguard the deposits. However, the Central Bank does not have legal authority to guarantee deposits or assure that any such institution will never fail.
- The Central Bank has introduced a Deposit Insurance Scheme to repay deposits up to Rs.300,000 per depositor in the event of a failure of a bank or a finance company supervised by it.
- When depositing money in any of the above institutions, please exercise due care for the safety of your deposits.

For further inquiries

Bank Supervision Department
Tel : 0112 477659, 0112 477120, 0112 477129
Fax : 0112 477711
Email :dbsd@cbsl.lk

Non-Bank Supervision Department
Tel : 0112 477500, 0112 477504, 0112 398614
Fax : 0112 477738
Email : dsnbfi@cbsl.lk

Web: www.cbsl.gov.lk

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The Credit Counselling Centre operated by the Sri Lanka Banks' Association with the support of the Central Bank of Sri Lanka

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- Help to understand the terms and conditions of your borrowings
- Assist to maintain a cordial relationship with your borrowing institution thereby avoiding additional borrowing costs and possible legal action.
- Advisory services on
  - financial management
  - restructuring your repayment process
  - managing your credit card debt
  - settling personal loans
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