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China's efforts towards sustainable development

An overview of recent policies

for a greener economy

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_____1992年在里约热内卢举行的第一次联合国环境与发展会议曾被誉为环境政策的一个里程碑。然而，这并不标志着一个真正的转变。在政治和工业方面，决策仍然很少考虑到气候变化、生物多样性丧失或资源减少。气候变化、资源减少、粮食安全、生态系统和生物多样性丧失都需要被视为优先事项并迅速采取行动。在环境危机的背景下，“绿色经济”已经成为越来越热门的讨论话题。“绿色经济”并不是一个尚未得到广泛认同或国际共识的概念。这是一个极其复杂的概念，短期内不可能就其意义、用途和有用性以及政策影响达成一致意见。“绿色经济”给人的印象是一种对环境友好、对保护自然资源的需要敏感、在生产过程中尽量减少损害环境的污染和排放以及为不损害环境的生存和消费服务的经济。人类需要一种新的“大变革”，所有国家之间的一种新的社会契约，接受地球所能提供的限度，并以人权为前提争取发展。

在过去的几十年里，中国的绿色经济决心变得至关重要。绿色发展不仅关系到中国人民，也关系到世界各国人民。中国绿色经济与国民经济增长和环境退化密切相关。上世纪70年代的经济改革使经济繁荣发展，但环境却因此受到影响，此后，北京一直在努力平衡环境保护和经济增长。中国环保工作的开始，除了“管道末端”¹的污染控制机制外，还有什么多的机制。

中国环境危机是实现中国快速工业化面临的最紧迫挑战之一。十多年来，国民经济增长平均每年增长了百分之十，是以牺牲国家环境和公共卫生为代价的。中国是世界上最大的碳排放源，许多主要城市的空气质量达不到国际卫生标准。严重的水污染和缺水也加剧了土地的退化。环境退化有可能破坏国家的增长，并耗尽公众对改革步伐的耐心。从1978年联合国人类环境会议期间开始，中国开始发展环境机构，但到那时，中国的环境已经陷入了困境。上世纪70年代末的经济改革鼓励了农村工业的发展，但进一步加剧了环境问题。如今，中国是世界上排放温室气体的大国，2007年已超过美国。2014年，中国占全球温室气体排放量的百分之二十七。煤炭是造成空气质量退化的主要原因。煤炭提供了中国约三分之二的能源结构。然而，由于中国经济正在放缓，煤炭需求似乎在下降。另一个加剧空气问题的趋势是中国的快速城市化，这增加了对新制造业和工业中心的能源需求。除了空气污染，缺水也是中国面临的另一个主要问题。过度使用和污染造成了严重的资源短缺。在中国660个城市中，大约三分之二的城市存在缺水现象。环境退化对中国经济增长构成严重威胁，使中国损失约占国民总收入的百分之三至百分之十²。

¹管道末端：管道末端是一种污染控制方法，在废水进入环境的地方清理受污染的水流或气流。

²中国环境保护部估计，污染成本约为1.5万亿元人民币（合227亿美元），约占国内生产总值的3.5%

中国政府制定了促进国家经济增长,加强环境保护的战略目标。中国领导人经常强调,中国致力于以提高能源和用水效率、转向可再生能源等关键步骤为基础的绿色发展道路。许多中国政策都符合绿色增长的范例。在“十一五”规划期间,中国几乎把绿色发展放在国民经济的主导领域。中国政府为提高工业、交通、建筑等能源效率,发展风能、太阳能等可再生能源,创造资源节约型“循环”经济,改造传统能源,做出了许多努力。除了新技术的发展和对绿色能源的更多投资,中国政府也采取了重要步骤,加强环境政策和立法。第十一、十二和十三个五年计划纳入了更雄心勃勃的环境政策目标。环境政策有助于提高公众认识,集中国民力量,调动资源,取得切实的环境成果³。由于仅有环境法规导致绿化国家经济体系不足,新修订的环境保护法于2014年生效,以应对气候变化,促进更可持续发展。环境保护法为环境保护提供了法律依据⁴,建立了新的监测评价制度⁵,新的诉讼制度⁶,新的污染方处罚制度⁷。中国政府还实施了促进绿色发展的具体政策。这些政策包括完善绿色金融体系、建立循环经济体系、进一步完善可再生能源、进一步实施污染控制机制。绿色经济政策不仅包括政府参与者,也包括更多对制定中国绿色经济议程感兴趣的利益攸关方。在利益集团中,中国政府发挥着根本作用;第二大利益攸关方是公众,特别是城市人口;第三利益攸关方集团是以企业为代表的,企业是绿色经济政策的关键运营商。研究机构确实在绿色经济中发挥着重要作用,因为它们向政府、企业和民间社会提供技术投入和政策咨询。

在未来几十年里,中国几乎为可持续发展的每一个方面都制定了目标。中国已经建立了长期的绿色愿景,应该达到或超过其雄心勃勃的绿色经济目标。然而,光靠绿色的愿景是不够的;还需要注意为实现绿色经济目标而采取的实际措施。对中国环境和人类福祉产生影响的不是绿色发展计划和政策,而是其实施。尽管中国为进一步实施绿色经济采取了重要措施,但中国需要确保以其作为世界经济领袖之一的声誉,建立高标准的社会和环境保护措施。持续不断的可持续发展工作包括中国的生态文明理念、具有强大生态保护元素的“十三五”规划,以及中国致力于绿化海外投资,帮助其他发展中国家实现可持续发展目标。然而,中国在实现其目标

³ 近年来,主要污染物(包括二氧化硫、氮氧化物和氨氮)减少了

⁴ 按照环境保护的要求,中国应实现经济和社会发展

⁵ 新环境保护法激励地方政府干部开展环境保护的工作

⁶ 新环境保护法扩大了资格,将连续5年以上活跃在环境公共服务领域的非政府组织包括在内

⁷ 新环境保护法规定,处罚应每天增加,没有上限限制

方面面临着各种挑战。在国内,地方政府的执行能力与中央政府发布的政策之间确实存在差距。此外,中国没有一套连贯的绿色经济政策。政策被纳入更大规模的发展规划和环境治理指令,并通过环境条例和激励措施在各部门实施。在中国境外,缺乏全面和易于遵循的指导往往是中国企业和投资者将环境保护纳入决策过程的主要障碍之一。尽管在实施绿色经济政策方面面临挑战,但中国正在尽最大努力走一条更可持续的道路。例如,与中国其他省份相比,江苏在将绿色经济的关键要素纳入发展规划和政策方面已经相对先进。自2011年以来,江苏通过了一系列产业升级、环境保护、绿色消费、绿色贸易和绿色就业的绿色经济政策。近日,江苏省政府优先重视培育绿色经济理念、加强重点部门战略管理、促进绿色投资和绿色转型、促进绿色发展等多个领域的工作市场,并加强绿色经济的基本能力,同时改善政策体系。在过去的四十年里,中国的环境保护发生了一些变化。中国环境保护工作的开端仅仅是管端污染控制机制。现在中国政府就更加意识到有必要形成一种防止污染过度的系统。提高能源效率,促进国家绿色发展体系建设,是中国政府的首要任务。作为世界第二大经济体和崛起的政治大国,世界不会仅仅通过在其境内取得的相对进步来评估中国的成功。相反,中国将因其全球足迹的减少或从"棕色"经济转向而受到评判。

撰写这份报告的目的是为了探索和追溯中国绿色经济在过去几十年中的演变。为了探索中国绿色经济的发展,我制定了旨在塑造中国绿色发展的重大宏观和具体政策;编写本报告的目的还在于确定并向读者介绍参与改善金融、环境工业、能源、林业和工业生产可持续性的关键部门政策和行为者。在本报告中,我借用了环境署对绿色经济的定义:"一种在不使后代面临重大环境风险和生态稀缺的情况下长期改善人类福祉和减少不平等的经济"(UNEP,2010)。环境署的定义适用于分析中国,因为它允许遵守与中国实现可持续发展有关的大量政策。

作为本报告的作者,我确实进行了广泛的文献综述。我评论的文献来源主要包括报道原创研究人员撰写的新和原创的研究或发现的文章、演讲、访谈、官方记录、教科书、杂志和期刊文章以及百科全书。在撰写这份报告时,我试图做到跨部门、更全面和更详细,尽量不产生偏见,因为大量的相关政策和文件可能会导致一些误解。报告的重点是通过绘制中国主要行为体的地图和促进向绿色经济过渡的政策地图,向受众提供对中国绿色经济进展的全面评估。

为了进一步阐明中国的绿色经济思维,并探索实现既符合环境目标又符合社会目标的绿色经济的潜在途径,我在报告中确定了三个需要进一步研究的领域:寻找适当的指标和评估方法,适当帮助衡量进展,通过海外贸易和投资解决与中国消费增长有关的渗漏问题,并改善绿色经

济的社会公平政策的决策和执行过程。这些领域对于客观评估中国对全球环境的影响特别重要。作为一个不断崛起的政治和经济强国, 中国将以其全球足迹的减少或从棕色经济的转移来判断。在希望中国取得成功的希望中, 通过这份报告, 我确实试图抓住中国实现长期可持续发展目标的道路。

LIST OF ACRONYMS:

UNCED: United Nations Conference on Environment and Development, also known as Rio Summit held in Rio de Janeiro in 1992.

UNCSD: United Nations Conference on Sustainable Development, also known as Rio 2012 or Rio+20, hosted in Rio de Janeiro in 2012.

OECD: The Organization for Economic Co-operation and Development, established in 1948. Currently it counts 36 countries as members.

UN: United Nations, an international organization founded in 1945, currently made up by 193 member states.

UNEP: United Nations Environment Programme, an agency of United Nations that coordinates environmental activities and assists developing countries in implementing environmentally sound policies and practices.

WTO: World Trade Organization, the only global international organization that deals with the rules of trade between nations.

UNDESA: United Nations Department of Economic and Social Affairs, it holds up the development pillar of the UN Secretariat. UNDESA's work promotes and supports international cooperation for sustainable development.

UNFCCC: United Nations Framework Convention on Climate Change, an international environmental treaty adopted on May 1992 during the Earth Summit in Rio de Janeiro held the same year. Its objective is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".

UNCTAD: United Nations Conference on Trade and Development; UNCTAD is a permanent body established by the United Nations General Assembly in 1964 and includes 194 member states.

NDRC: The National Development and Reform Commission (国家发展和改革委员会 *guojia fazhan he gaige wei yuanhui*); it is one of the most influential players involved in shaping China's green economy agenda. The NDRC is a "super ministry" that oversees China's macroeconomic planning and social development across China's economy.

MEP: The Ministry of Environmental Protection of the People's Republic of China (中华人民共和国环境保护部 *Zhonghua Renmin Gongheguo Huanjing Baohu Bu*).

CRED: Center for Renewable Energy Development.

SDPC: State Development Planning Commission

MoF: Ministry of Finance

PBoC: People's Bank of China

INTRODUCTION

In recent years, China has moved from being one of the world's developing countries to the second biggest economy worldwide (following the United States of America); China's population is the biggest in the world, making Chinese social background extremely complicated, therefore it is essential for the Chinese government to ensure its people better quality of life, while maintain its economy competitive in the world's financial market. Since the late 1970s, with the opening up reforms, China began to improve its industrial system and started to compete with other more developed competitors. The key for Chinese success was the ability to produce large amounts of differentiated products at really low costs; for this reason China started to be called the world's manufacturing country, since it provided all sort of products and manufactured goods to the other countries in the world. The uncontrolled economic development was followed by severe environmental downsides, caused by the limitless use of environmental resources, the exploitation of land, the lack of control on pollutant emissions and the lack of environmental standards (Elizabeth C. Economy, 2004).

For decades, government's attention was focused only on economic development, citizens' health issues and environmental degradation were not considered critical matters. As a consequence of heavy industrial activities and very few regulations safeguarding the environment, air pollution, water pollution and water scarcity, and the reliance on high polluting energy sources started to be, along with many other environmental downside effects, the Chinese plague (MEP, 2013).

The severe damages Chinese environment was suffering needed to be treated quickly, and Chinese leadership began to implement new policies aimed to improve environmental conditions while maintaining the economy competitive (Geall, 2013)

Since 1989, with the very first Chinese Environmental Protection Law, China started to increase the attention on environmental issues; the government took serious actions in the war against pollution by limiting the amount of pollutant emissions, by reducing the use of coal for industrial purposes, and by creating a more efficient mechanism of coordination

between central and local governments. Chinese Five-Years Plans were considered as well useful tools for improving environmental standards and regulations, and from the 11th Five-Year Plan environmental protection was included as one of the main goals to be achieved by the Chinese government (Hu, 2006).

Nowadays, although improvements made on green economy and China's actions to prevent climate change side effects, China is still one of the most polluted countries worldwide; it is the biggest CO₂ emitter in the world and the reliance of coal has increased since the beginning of the 2000s. The lack of coordination and different interests between the central government and local authorities have caused environmental degradation to worsen (Shobert, 2014).

Environmental concerns are spreading across the entire population and, thanks to the internet, more and more people are becoming aware of environmental issues in their country. Protests concerning climate change and pollution effects on people's health have been organized by citizens and by national environmental NGOs. Public interest and public participation on political matters has grown during the past decades, and Chinese citizens do possess new tools they can use to make the government listen to their opinions and take actions in order to reduce public concern (Chai, 2015⁸) (Caxin, 2015).

China's green development does have implications not only for the 1,4 billion people within Chinese borders, but also for the rest of the world. If past policies were more concerned with "end-of-pipe" environmental protection, today's policies are promoting a broader concept of sustainability within Chinese overall development strategies. The success or failure in China's transition to green economy will determine future carbon emissions, investments, as well as the entire model of economic development set for the economies in the global south.

⁸ In February 2015, the Chinese reporter Chai Jing produced a documentary, "*Under the Dome*", which went viral upon its release. The documentary depicted interviews with environmental officials, industrial business managers, and health officials in China and Los Angeles, receiving up to 200 million hits on Chinese websites before its removal by Internet censors.

Chinese strategy for developing green economy do include, along with policies targeting renewable energies, energy efficiency and industrial production, a wider range of sectors, a vast range of stakeholders.

The world's eyes are on China's attempts of greening its economy: if Chinese strategies prove to be successful in reducing the threat of environmental degradation, then China will easily be the world's leader in paving the way for a greener future; if the efforts of the Chinese government end up being insufficient, the consequences will be harder challenges for the entire world to face.

1. CHAPTER ONE

1.1 SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

Sustainability is a broad discipline, which gives insights into most aspects of human world from business to technology to environment and the social sciences.

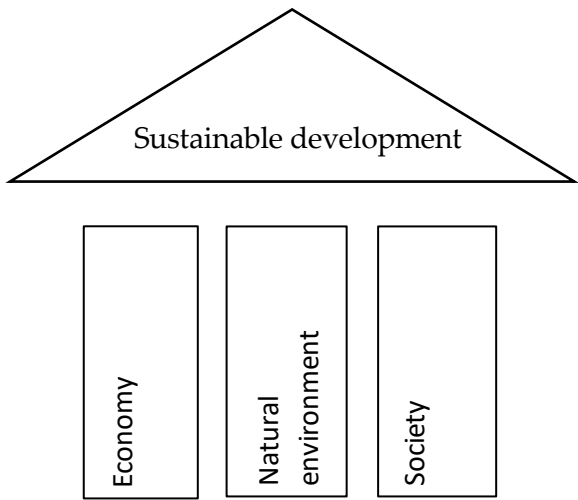
The definition of sustainability is the study of how natural systems work, in terms of their ecological interactions and balance. Sustainability also takes into account that humanity uses natural resources to sustain material well-being. In short, sustainability seeks to protect the natural environment and human health, while driving innovation and not compromising our access to material well-being.

The Brundtland Commission⁹ described sustainable development as *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”*. In this sense we must consider the future in making our decisions about the present.

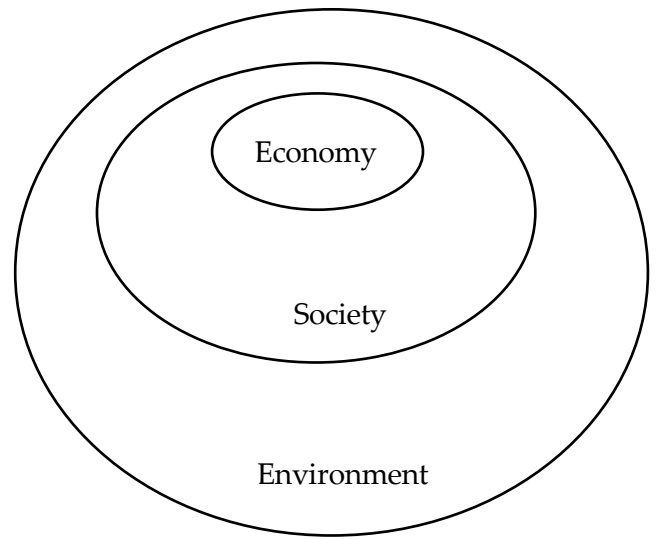
The core of mainstream sustainability thinking is the idea of three dimensions, economic, social and environmental development. These dimensions have usually been drawn as “pillars”, as concentric circles, or as interlocking circles, depending on the degree of importance each one of us has given to each dimension.

⁹ Brundtland Commission is also formerly known as the *World Commission on Environment and Development (WCED)*. It was established in 1983 and dissolved in 1987; its aim was defining sustainable development.

a. The three pillars of sustainable development



b. Concentric circles



c. Overlapping circles

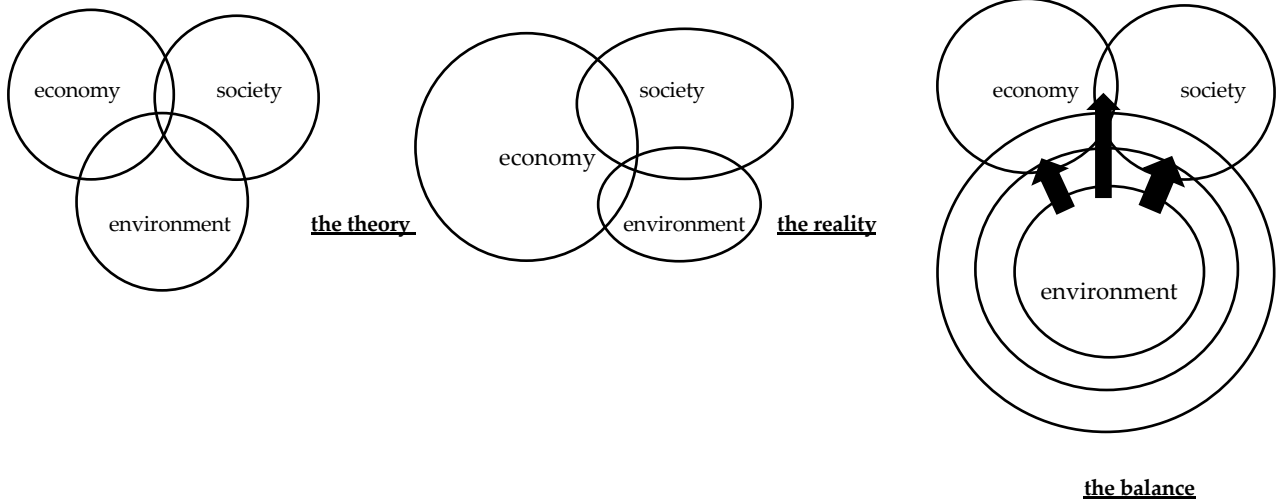


Figure 1: Three visual representations of sustainable development: pillars, circles, interlocking circles

These visual representations of sustainable development each contains three aspects.

Economic development's focus is providing people with an increasing level of economic opportunities and material well-being in durable ways. This dimension relates to a wide array of issues of policy interest: such incentives for businesses to adhere to sustainability guidelines beyond legislative requirements, and to encourage and foster incentives for the average person to do their bit when and where they can (the World Summit on Social Development, 2005). Social development includes many aspects, most importantly, the protection of the health from pollution and harmful activities of businesses and other organisations, the access to basic resources without influencing in any way the quality of life, and finally encouraging people to participate in environment sustainability and teaching them about the bad effects of not reaching sustainability goals (the World Summit on Social Development, 2005).

The environment represents the primary concern of the future of humankind. It encompasses our capacity to understand and protect ecosystems, air quality, integrity and sustainability of our resources, identifying and curtailing those elements that put stress on the environment. It is also closely related to the role technology may play as a driver for a greener future (the World Summit on Social Development, 2005)

In the "three pillars representation" (**figure a**) each pillar, economic, social, environmental, is kept in balance, otherwise it will make sustainable development crumble in pieces. This view may seem "utopian" because the majority of national and international problem solving efforts use to focus merely on one pillar at a time. For example, the UNEP focuses on the environmental pillar. The WTO focuses on the economic pillar, though the OECD gives more attention to the social pillar. In this way no sustainability goal can be achieved, because if any pillar is weaker than the others, the system as a whole will result in unsustainability. The three pillars system is also seen as way too simplistic for deeper analysing sustainability and does not offer a complete outlook of the impact played by each of the three elements we consider fundamental for sustainable development.

This is the reason why we move to the overlapping circles representation (**figure c**); in the three pictures we see three different circles combined together, in the first picture representing the theory of sustainability, each circle is drawn having the same size and the same importance, meaning that all three domains, economic, social and environmental, play a specific but complementary role and have the same impact in keeping growth sustainable.

In the picture representing “reality”, we see an example of the effect in sustainable growth if organizations give the economic domain more importance than the others. Finally, in the last picture, called “the balance”, we now see that the circles are back to the same size, but now the environment plays an essential role in influencing the decisions within the economic and social fields.

In the concentric circles representation (**figure b**) we see a more complex and “correct” way to analyse the relationship between the three interconnected systems. The largest system of all is the biosphere we live in. the biosphere contains the human system, composed by two main sub-systems: the social system and the economic system. When people form a group, and groups of people, whether they form a tribe or a nation, agree to form a government they form a social contract in order to increase their general welfare. The contract binds the social and the economic systems of the group of the individuals together. The people (the social subsystem) work together under a central government to maximize their economic system’s output. In this context, environmental sustainability has the highest priority, because the lower the carrying capacity of the environment, the lower the common good delivered by the social system and the less output the economic system can produce.

1.2 WEAK VS STRONG SUSTAINABILITY

For what concerns the environment, the idea of sustainability has been split in two concepts, also known as “weak sustainability” and “strong sustainability”

The theory of weak sustainability affirms that natural capital has a determined value and so, if it ends up being insufficient, it can be replaced by manufactured capital of equal value. (Ekins, et al., 2013; Neumayer, 2003; Neumayer 2012.)

By contrast, strong sustainability theory explains that the existing stock of natural capital must be maintained and/or, enhanced because the functions it performs are impossible to be duplicated by manufactured capital. (Noel and O’ Connor, 1998; Ekins et al., 2003; De Groot et al., 2003; Brand, 2009)

Since natural resources provide materials and services humanity can use to produce manufactured capital, weak sustainability basically means men can replace or duplicate natural materials and services simply by using manufactured goods and services. In contrast, strong sustainability means that natural materials and services are impossible to be duplicated.

From a weak sustainability perspective, technological progress is meant to generate several technical solutions to the environmental problems caused by the increased productions of goods and services. The only thing that is really important in weak sustainability is the total value of the aggregate stock of capital, which is supposed to be maintained or ideally increased in order to provide a better life for future generations (Sollow, 1993).

The supporters of strong sustainability, on the other hand, invoke several reasons to demonstrate the non-substitutability of natural capital:

First, the qualitative difference between manufactured and natural capital. While manufactured capital can be reproduced and its destruction is rarely irreversible, the consumption of natural capital is mostly irreversible (for instance, the species extinction is irreversible, whereas the destruction of material goods or infrastructures is not) (Ekins et al., 2003).

Second, natural capital is essential for the production of manufactured goods, the biophysical structures of natural capital will never be substituted by manufactured capital (Ekins et al., 2003).

Third, the increase of future consumption is not the appropriate substitute for losses of natural capital (Toman, 1992; Dedeurwaerdere, 2013).

A necessary notion to introduce, in order to better analyse strong and weak sustainability, is “critical natural capital”. Critical natural capital is identified as “natural elements which provide unique contribution to human well-being”. (Ekins et al., 2003; Dedeurwaerdere, 2013)

Critical natural capital is essential in maintaining the ecological functioning of natural systems above certain levels of degradation so they can preserve the capacity of natural capital to provide services, defined critical, for human existence (Noel and O’Connor, 1998; Ekins et al., 2003; Chiesura and de Groot, 2003; de Groot et al., 2003; Dietz and Neumayer, 2007; Brand, 2009).

The notion of critical natural capital highlights the fact that weak sustainability does not take into account the value some natural elements possess and are impossible to duplicate by men, for instance, how much is a forest full of trees worth? A value can be calculated if we assume that all the trees will be cut down and turned into paper.

However, the forest provides home for several species of animals and plants, so the value of these species is definitely higher than the value of any manufactured product or service. In this sense, strong sustainability asserts the necessity to maintain the environment in balance, because humankind will never be able to recreate what nature provided; the ozone layer is the perfect example of an ecosystem service that is and will be difficult or even impossible to duplicate (Hart, 1998).

It is not clear yet what sustainability or sustainable development will look like in the future, but we can say there is a growing faith in technological improvements that will possibly end up with positive outcomes. Humanity is far more aware of the damages created by pollution and by uncontrolled consumption, so now we see there is the desire to improve quality of life for future generations while achieving economic goals (UNCED, 1992).

1.3 THE CONCEPT OF GREEN ECONOMY

The growing desire to improve quality of life in the future while at the same time achieving economic goals has been translated in the concept of “Green Economy”, that has become the centre of political debates in recent years. It was especially during the United Nations Conference on Sustainable Development (UNCED), held in June 2012 in Rio de Janeiro, that the major theme chosen for the conference was *“a green economy in the context of sustainable development and poverty reduction”* (Rio plus 20 conference, 2012).

The concept, introduced during the UNCED and espoused by the European Union (EU), the Organization for Economic Co-operation and Development (OECD), and the United Nations (UN), represents a new economic growth paradigm that is friendly to the earth’s ecosystems and at the same time can contribute to poverty alleviation. The concept of green economy responds to the “growing recognition that achieving sustainability rests almost entirely on getting the economy right” (UNEP, 2011).

Between the terms sustainability and green economy, a slight difference is that green economy entails risks and challenges, particularly for developing countries, for whom economic development is still considered risky. One of the biggest challenges for these countries to face is that this new economic development mode would reinforce protectionist trends, that in turn would unleash new forces reinforcing international inequalities.

However, the concept of green economy is still gaining success as it provides a response for the multiple crises faced by the world in recent years, to name a few: the climate, the food, and the economic crises. In this sense, a possible transition to green economy will entail moving away from the system that allowed and sometimes generated these crises to a new one that addresses and prevents them.

There is not a unique definition of green economy, but the term itself underscores the economic dimension of sustainability (UNEP, 2011) and emphasizes the point that economic growth and environmental stewardship could be considered complementary strategies.

In this view the concept of green economy is consistent with the concept of sustainable development, as it encompasses the three pillars of development (economic, social, environmental) and the focus on inter-generational equity.

The concept of green economy has been mainstreamed into the work of the UN and placed integrally within the holistic framework of UNCED, the Rio Principles and Agenda 21. The UNCED framework recognised the principle of “common but differentiated responsibility” in the Rio Declaration. The principles acknowledged, on one hand, that developed countries have more resources due to the imbalances in the world and thus have greater responsibility in resolving environmental problems. On the other hand, developing countries were hampered from meeting the basic needs for their population because of their unfavourable positions in world’s economy and because of lack of sufficient resources. For these countries development is the top priority and environmental concerns must be integrated with, not detracted from, development objectives (Ocampo, 2012; Khor, 2012)

The UNCED framework, using the principle of common but differentiated responsibility as a launch platform, built some of the key complexities of an integrated approach such as:

- It recognised the sustainability principle, the environmental crisis and the need for reforms of production and consumption patterns, in order not to compromise the needs of the future.
- It recognised the “right of development” and development needs of developing countries, plus social development.
- It accepted the three pillars of sustainable development as environmental protection, economic development and social development.
- It recognised the need for national and international policies regarding the understanding and the addressing of the sustainability issues.
- It recognised developing countries’ need to be supported by international policies in order to meet and implement sustainable development goals.
- It recognised the fact that countries played different roles in contributing to the environmental crisis, that among countries, different levels of development exist, and that more developed countries must lead to key principles and have even more

important implications for concrete actions and for the international cooperation framework.

- It recognised that developed countries were the main contributors to pollution and resource depletion, and that developing countries have several more disadvantages because of the lack of “environmental space” left, causing severe implications for their future development.

In practice, these key complexities had to be translated in a three-prong approach designed to help achieving sustainable development:



1.4 GREEN ECONOMY AND ITS MACROECONOMIC DIMENSIONS

When assessing green economy we should focus our attention on the *macroeconomic dimensions of green economic growth*, easily summarised in four key points:

1. ***Inter-temporal welfare***: how the welfare of future generations is taken into account in current economic policies. This issue is relevant for several investments today, but has a broader implication, because the Social Discount Rate (SDR) used to value in current economic decisions the consumption (welfare) of future generations and the environmental damages created today will affect economic activities only in the future. This implies that strong actions today will ensure future generations against any asymmetric and non-linear effects that certain developments could have on the ecosystem (Ocampo, 2005)
2. ***Effects on aggregate supply***: using the strategy of reallocating investments toward the green economy may cause a lower potential economic growth for few years, since renewable natural resources are replenished, but in the long run it could result in faster economic growth. Furthermore, investing in green economy may reduce downside risks of events associated with climate change, energy shocks, water scarcity and loss of ecosystem services. In the long run, they could also result in increased employment and have direct benefits on poverty reduction. Of course the composition of consumption and investments must be carefully controlled to avoid excessive resource depletion and waste, whereas environmentally-friendly investment and consumption should expand (UNEP, 2011).
3. ***Green growth as a process of structural change***: here the focus is put on a vision of development as the capacity of an economy to generate new dynamic activities. In this alternative “structuralist” view the changes in production structures are not just a side effect of growth, but rather are among the prime movers. (Ocampo, 2005; Ocampo et al., 2009). This structuralist view has major policy implications. It is impossible for growth and development to proceed if conscious policies are not chosen to drive the transformation of the previous system towards new dynamic activities that would play an essential role for long-term economic expansion.

For this reason green economy involves no less than a technological revolution and major changes in production and consumption patterns (Ocampo, 2005).

4. *Financing green economies in developing countries*: the amount of resources required for the transition to the green economy have been subject to a series of diverging estimates. UNEP's Green Economy Report has estimated investment needs for the green economy, placing them in the range of \$1 to \$2,6 trillion per year (1.6 to 4 % of estimated world GDP in 2011).

Close to three-fifths of the sum would be invested in energy efficiency, with a particular attention on buildings, industry and transport, and on renewables. The remainder would be invested in tourism, water, agriculture, fisheries, waste management and a small amount in forestry. Over half of the estimated needs would come from developing countries, particularly regarding the energy sector, where is predicted that the demands of energy will expand. The priority in the allocation among developing countries should obviously be given to the poorest countries and to those more likely to be affected by climate change; we said obviously because of the tight link between green economy and poverty alleviation (most particularly in sustainable agriculture, water and sanitation). In allocating funds across different economic agents in recipient countries, priority must be given to public sector infrastructure investments, considered critical in assisting the transition to green economy (Stern, 2009; Enkvist et al., 2010; UNDP, 2009; Tirkpak and Parry, 2009).

1.5 WHY MOVING TO THE GREEN ECONOMY: BENEFITS, CHALLENGES AND RISKS

One of the main benefits in adopting green economy is the alleviation of environmental impact, caused by pollution, globally and locally. On a global scale, green economy would sustain the fight against global warming, desertification, water pollution, and the loss of biodiversity. At local level, if successful, it should result in the reduction of vulnerability of poor people to the impacts of climate change, desertification, ocean pollution and degradation, and loss of biodiversity.

Green economy is not only environmental in scope, but is also development in economy and society and from an economic development perspective there are several ways in which it may result a benefit for both developed and developing countries. Cosbey asserts that, with a new type of economy, new markets may be created in strategic areas such as biofuels and renewable energy sources. At the same time, green economy may enhance the value the poor in developing countries derive in agriculture, fisheries and forestry. Developing countries especially might gain more from green economy as it might provide more economic and social advantages. For instance, access to energy services could be improved by investing in alternative and renewable energy sources, thus reducing the amount of energy importation and saving money. The improvements in resource efficiency will derive from a cleaner agriculture and, due to the new sustainable agricultural techniques, food security would also be improved. Eventually, it is supposed that emerging and developing countries may benefit from the new agricultural techniques by the exportation of agricultural products and the offer of new green services (Cosbey, 2004)

With a shift to green economy, the population would gain from renewable energy sources not only in terms of economic growth, but also in population and environmental health, whilst also improving energy security in the long run.

However, transitioning to a green economy is not an easy process, because of the lack of technology required for some countries and the need to guarantee the well-being of the citizens during the transition. Also, such a big shift does not occur overnight, but it takes years in which, as explained by the UNEP's green economy report, the new allocations of

investments towards green economy will slow down the economic development until natural resources are restored, in order to faster economic development in the long run.

While the benefits seem to be appealing to numerous countries, especially developed ones, some concerns have been raised by developing countries' delegations, fearing that the "green economy" concept might be misused or taken out of context and might as well give rise to negative developments that must be avoided¹⁰.

1. ***One dimensional approach:*** this is the first risk, related to the fact that green economy may be defined or operationalised in a one-dimensional manner, and promoted as purely "environmental" without considering the development and equity dimensions, and the international dimension, especially the negative effects on developing countries. If green economy concept gains prominence in such a situation, there will be the chance to lose the holistic sustainable development approach, with imbalances between the three pillars (Khor, 2011).
2. ***"One size fits all" approach:*** the second risk is mostly related to the approach used to adhere to green economy. There is the fear that using this approach, it would lead to failures for environment, development, or both. To avoid any risks, the principle of common but differentiated responsibility should not only be respected, but also operationalised. Thus policies and targets, flexibility and special treatments should be provided for developing countries, such as allowances, provision of finance, exemptions, technology and capacity building (Khor, 2011).
3. ***Using environment for trade protection:*** the third risk is linked to the environment. Concerns are centred on the fact that environment could be used by countries for trade protectionist purposes. The fear is that developed countries might use the environment as a principle to justify unilateral trade measures against developing countries' products. One example can be the proposals or plans to impose the so called "carbon tariff" on products that generate emissions of carbon dioxide above a certain level during production process, or that exporting countries which do not

¹⁰ These concerns were raised at the first preparatory meeting of the Rio Plus 20 process held in May 2010 and at the United Nations Conference on Trade and Development meeting on the green economy.

have emission controls considered adequate by importing countries will be impeded to export their products. Against these measures, several developing countries assert that any of these measures may penalise developing countries that lack of financial resources or access to low-emission technologies and are more keen to violate the principle of common but differentiated responsibilities (Khor, 2011).

4. *Using environment as a way to gain market access:* another risk regarding the environment is the one of a possible misuse of the environment to promote access of some countries' goods and services into markets of other countries, thus promoting mercantilist interests. Major concerns were expressed by developing countries in WTO that developed countries tried to get them to eliminate tariffs on many goods claimed to be "environmental goods". In trade definition, environmental goods primarily refer to goods used to preserve the environment, such as renewable energies and pollution management systems. On environmental goods, the US-EU argue that the elimination of the tariffs may benefit developing countries, since the products will be sold at cheaper prices. In the same line, developing countries fear that the elimination of the tariffs would lead to a new type of liberalisation, that in the end would impede them to have more policy space and more options to develop their own industries and products. The market opening of developing countries to developed countries' environmental goods and services would indeed lead to technology-dependency, in which developed countries would become the sole providers of environmental goods and services (South Centre, 2007)
5. *The treatment of subsidies:* another concern of developing countries is that developed countries may provide their companies with subsidies for the research and development of environmentally sound technologies. This may put developing countries at a disadvantage, since they lack the financial resources to fight against developed countries' subsidies. Because of the unfair imbalance in subsidies, developing countries and their subsidies will find themselves in a worse competitive situation if they have to lower tariffs on environmental goods and services we talked about before (Khor, 2011).

There are two more important risks developing countries may face thanks to green economy: one risk is the adoption of environmental standards for products; if developed countries fail in meeting the standards, they will face the prospect of losing the majority or the total amount of their exports. Another risk is that green economy may be considered a “conditionality” on developing countries for aid, loans, and debt rescheduling or debt relief, thus potentially pressurising developing countries to take one-dimensional environmental measures rather than sustainable development policies.

1.6 PROMOTING SUSTAINABLE DEVELOPMENT AND GREEN ECONOMY THROUGH POLICIES AND MEASURES

Policy makers and the public must recognise the economic and social value of the environment as crucial and that conserving resources (such as clean air, clean water, forests, etc) have positive outcomes, valuable for meeting basic and human needs besides their intrinsic environmental worth. Governments should promote conservation, and investments on rehabilitation of damaged natural resources should be made.

Environmental biodiversity is essential in providing “services” that contribute to human well-being, including *Provisioning services* (food, crops, water, medicines), *Regulating services* (filtration of pollutants by wetlands, climate regulation, pollination and protection from disasters), *Supporting services* (soil formation, photosynthesis, nutrient cycling), and *Cultural services* (recreation, education, spiritual and aesthetic values). In order to enable the flows of these ecological services, it is necessary to maintain and/or augment the stocks of natural resources. On the other hand, depleting stocks will cause the reduction of flows of ecological services in the future, with severe adverse effects on human well-being (Khor, 2011).

Along with the benefits derived from the conservation of natural resources due to their economic and social value and their contribution to human well-being, there should also be the recognition of the opportunity cost¹¹ of not “exploiting” or using up the resources. The long-term usefulness of conserving nature, or making use of resources sustainably, should be recognised and reconciled; there should also be the need for international support to developing countries in offsetting opportunity costs. Another important measure is the public expenditure on restoring damaged ecosystems, since they provide valuable services, such as water supply, soil retention, flood control, mitigation of extreme weather events. Damaged ecosystems can cause severe damages to numerous countries and regions, that is why it is necessary to restore the natural capital, that in turn will reduce the adverse effects and enable the resumption of the environmental services.

¹¹ Opportunity cost: the benefit forgone due to the fact that the resource providing the service can no longer be used in its next-most-beneficial use.

Unfortunately, financial support in restoring damaged ecosystems is insufficient in many of developing countries, thus requiring more international support (Khor, 2011). However, international support alone cannot be the only way in helping countries to move to a more sustainable green economy; national governments, besides their regulatory functions, have important roles in strategic policy-making in orienting economic and social sectors towards a sustainable development pathway. In developing countries we see the state having a strong role in promoting production patterns oriented towards environmentally sound patterns, while at the same time ensuring stable economic growth and social development.

One question still arises: since economic growth is the imperative in developing countries, how can it be combined with the emissions trajectory? The United Nations Department of Economic and Social Affairs (UNDESA) in 2009 expressed some concerns regarding the shift towards green economy in developing countries. Concerns revolved around the daunting challenge revolved around the response to climate change developing countries will face in a far more constrained environment, since the majority of atmospheric space has already been used, mostly by developed countries. DESA argues that a shift towards a more sustainable economic growth could be achieved, but it would take very costly socio-economic adjustments and would require a high level of international support, together with a strict state control, to boost finance, technology and institutional capacity (UNDESA, 2009)

Left to the theory, the shift to green economy could sound easy, but one of the major issue when it comes to moving to a sustainable economic growth is the need for regulating markets and corporations. We all know the essential role the private sector play in the transition to a green economy, therefore they should be obliged to operate within the framework of governmental regulation and policies. The intensely competitive environment in which companies operate has made difficult for them to take a sustainable development pathway; indeed, much of the pollution, extraction and depletion of resources worldwide have been the result of activities of companies, especially the big ones. Since the lack of environmental consciousness surrounding the operations of companies, governments must establish regulations, incentives and disincentives in order to align

corporate practices to environmental, social and development objectives. Regulatory mechanisms are thus seen as crucial instruments to be central components in the promotion of the green economy, seen the importance of regulating the private sector, especially the large companies (DESA, 2009; Hallstrom, 2011).

1.7 TECHNOLOGY DEVELOPMENT AND TRANSFER

A key for successful environmentally-sound economic growth is the access to technologies. The role of technology transfer to developing countries was recognised in the 1992 Rio Summit; it was said that technology transfer went beyond the commercial arena and that access to technology by developing countries had to be favoured by policies both at national and international levels.

Technology transfer was one of the key “means of implementation” in Agenda 21. Chapter 34 of the agenda defines environmentally sound technology as not just individual technologies, but a total system including know-how, procedures, goods and services, equipment and organisational and managerial procedures. The UNFCCC also recognised technology development and transfer in several provisions including (Khor, 2011):

- Art. 4.3: *“developed countries shall provide financial resources including for technology transfer needed by developing countries to meet their agreed full incremental costs of implementing measures”*
- Art. 4.5: *“developed countries shall take all practicable steps to facilitate and finance transfer of and access to environmentally sound technologies and know-how particularly to developing countries; and shall support the development and enhancement of endogenous capacities and technologies of developing countries”*
- Art. 4.7: *“the extent to which developing countries will implement their commitments will depend on effective implementation of developed countries’ commitment on financial resources and technology transfer”*

There has been little transfer of climate-friendly technology under the UNFCCC, despite the recognition of technology transfer’s central role in the shift towards green economy.

An important aspect to keep in mind when we talk about technology transfer is that it is not merely the import of machines and hardware, but it is also the building of local capacity so that developing countries can design and make technologies that eventually will be diffused in the domestic economy.

When we face the initial phase of technology development, there are some stages to go through for a developing country (UNCTAD, 2007):

1. *Initiation stage*: developing countries are dependent on capital imports, some of which high in cost;
2. *Internalisation stage*: developing countries reduce costs by producing products locally through imitation under flexible intellectual property rights (IPRs);
3. *Generation stage*: developing countries' local firms are able to design and make their own original products. There is no more the need to imitate developed countries' products since the technological capabilities have been acquired.

However, for a developing country to generate its own technology there are several barriers that may also impede the correct technology transfer; some of them include poor infrastructures, inadequate laws and regulations, shortage of skilled personnel, lack of finance, ignorance of technology issues, high costs of certain technology agreements, problems with equipment, with equipment supplies, and intellectual property rights.

In order to reduce the barriers and promote sustainable development, an essential measure could be to expand the space for technologies in the public domain, and to expand as well the transfer of publicly-founded technologies to developing countries. An important role is played by developed countries, which may fund R&D programmes in developing environmental friendly technologies. At international level, public funding and joint planning of R&D programmes could generate technologies that should be placed in the public domain.

Talking about patents, they should not be an obstacle for developing countries to have access to them. Agenda 21 agreed on the necessity to adopt measures to guarantee the access of developing countries to privately own technologies. Such measures include incentives by developed countries to transfer technology, the purchase of patents and licenses useful for their transfer, the prevention of the abuse of IPRs, the provision of funds for technology transfer, and the development of mechanisms for private technology access and transfer.

1.8 FINANCING SUSTAINABLE DEVELOPMENT

Along with technology transfer, the Rio Summit and Agenda 21 gave financing a critical role in implementing sustainable development objectives.

Agenda 21 made clear the rationale for international financing. For developing countries, economic growth, social development and poverty eradication are seen as the overriding priorities, essential to meet sustainability objectives. Due to the international nature of sustainable development and the strong global effects of not achieving sustainability objectives in the near future, providing funds to developing countries is a common interest for humankind in general, including future generations (UNCED, para. 33.3).

As suggested by Agenda 21, the outcome of international funding would be that developed countries might afford to make financial commitments, with developing countries drawing up their national sustainable development plans. Under the UNFCCC developed countries decided to provide financial resources for developing countries to meet the costs of mitigation measures and adaptation costs as well (UNFCCC, article 4.3). One thing is sure, the extent to which developing countries will be able to meet their sustainability goals depend on the effective finance and technology transfer commitments promised by developed countries. Until these days, the implementation aspects of finance obligations have been weak, since the majority of developed countries' funding for sustainable development activities is not adequate yet. Estimates have been made on the amount of funding needed by developing countries to promote climate mitigation and adaptation activities, and the amount estimated is at several hundreds billions of dollars a year, or even more. The World Bank estimated that mitigation costs in developing countries would cost \$140-175 billion a year over the next 20 years; for adaptation, a report made again by the World Bank estimates that annual adaptation costs between 2010 and 2050 will be around \$75-100 billion a year. As noticed before, there is a big gap between what is needed and what has been provided for sustainable development; even though not sufficient, the existing funding is mobilised towards sustainable development activities (UNDESA, 2009; World Bank, 2010).

Issues regarding the transition to a green economy include external debt, trade policies, commodity prices, volatility in the international flow of funds, and reform of the international monetary and financial systems. Many of these issues were discussed in the 1992 Rio Summit and were included in Agenda 21. Issues in the global economic and finance systems are an integral part of sustainable development framework and thus should be essential in discussing green economy. In particular, a larger portion of financial resources could be made available through better development-oriented trade policies, debt relief to developing countries facing debt-related difficulties, a more development-oriented intellectual property system and more appropriate reforms to the international financial and monetary system.

2. CHAPTER TWO

2.1 CHINA'S ROOT CAUSES FOR ENVIRONMENTAL DEGRADATION

In 1978, China was one of the poorest countries in the world, with only one-fortieth of the real per capita GDP of the United States. In just three decades China has experienced a tremendous increase in economic development, due to severe intensive urbanization and industrialization policies. China not only had been able to climb out of the widespread poverty, but has also transformed itself into the world's largest producer of consumer goods and is fighting against the United States for the "first largest economy" title (Liu, 2012).

However, economic development led the PRC government think in Western terms about the damages the excessive and uncontrolled domestic economic growth could have had on the environment. So, in short, China's environmental situation may be considered a direct result of the rapid industrialization, which happened at a pace and on a scale without any precedent.

Since 1949 China's GDP¹² has increased approximately by 10 times, and so consumption of natural resources has increased as well by over 40 times. Chinese economy has seen in more than 20 years, from 1985 until today, its highest increasing rates (Ren Haiping, 2007).

During 1980-91, China enjoyed exceptional economic growth, which was accompanied by a similar growth in energy consumption. As predictions say, in developing countries, economic growth is followed by a second related trend of air quality problems. Since energy supply facilities are located in or near the cities in China, Chinese largest cities experienced the negative effects of the rapid energy consumption growth, with thousands of people being exposed to a multitude of pollutants, often above the levels the guidelines approved by the World Health Organization.

¹² GDP: Gross Domestic Product, the monetary value of all finished goods produced within a country's borders in a specific period of time. It is commonly used as an indicator of the economic health of a country.

China is now paying a high price for economic achievements, particularly due to the excessive use of natural resources, which has gone too far from the conventional use, and the extraordinary loss of the ecological environment.

We may analyse China's economic growth from two different perspectives: from an economic perspective we may say that China's rapid growth was favoured by the increase of capital investments, the promotion of international trade, a cheap and growing labor force, land resources, and a huge domestic consumer market. However, from an environmental perspective, China's rapid growth was determined by high levels of energy consumption, high pollution emissions, and over-reliance on the increase of investments (Yang, 2006). Western countries have always adopted the strategy of "first pollution and then control": when it came the turn of China to industrialize, she followed the path of its western predecessors. Considering China as a developing country we may say that, in opposition to developed ones, it is now at a different historical stage: developed countries have already consumed a big amount of natural resources in order to succeed in their economic development, so China as well, as a developing country, is using an enormous amount of resources for its development, while at the same time producing a frightening amount of pollution emissions that will, if not controlled and reduced, inevitably undermine the sustainability of Chinese development.

One of the main reasons behind the difficulties in achieving environmental protection is the lack of sufficient investments by the government. The difference between the investments in industrial development and production against investments in pollution control and enforcement has severe implications for the environment, since the use of energetic sources is inefficient and the amount of waste production is huge. Although the environmental control systems have to be considered at work, the truth is that, to a large extent, events are uncontrolled. Another important explanation of why environmental concerns are not considered as important as economic issues by the government is that, as a growing economy, China needs to attract foreign investments and foreign manufacturers to deepen its economic openness. To do so, Chinese government has adopted more lenient standards in the control of environmental degradation for foreign manufacturers.

Due to this competitive advantage, China has attracted a huge amount of foreign manufacturing companies that in turn established their subsidiaries within the Chinese borders and so helped drastically increasing environmental degradation.

One of the root cause of China's environmental challenges is that the country's environmental regulatory agency is heavily underfunded, meaning that the ministry does not possess the funding necessary to provide the industry oversight to monitor, report, and penalize environmental polluters. In theory, the country had approved regulations that protect the environment and fine the polluters, but in reality their implementation is extremely loose so very few people do pay attention on environmental laws and regulations. While we may admire China for its rapid economic growth, we may also consider that it weights entirely on the environment's shoulders (Byrne, 1996).

China's modernization took place using technologies that were an order of magnitude larger in their environmental footprint than what western countries had at their disposal during their more gradual periods of economic growth throughout history. When we do compare China's modernization today with that of the British Empire in the 19th century, China's speed of development is 100 times more than Britain's¹³. To a great extent, China's rapid industrialization caused environmental damages that surprised everyone, to the extent that officials were left unprepared to handle the situation due to the lack of sophisticated and government-funded regulatory systems.

The second root cause of China's environmental crisis is the reliance of the country over the last thirty or forty years on coal-fired power. Coal has been not only employed in the power sector in an extensive way, but also used in lower-standard plants. It sounds not surprising that in 2014 a study revealed that more than half of China's air pollution may be attributed to coal use alone.¹⁴ It may seem a good news knowing that, in recent years, China appears to be moving away from highest-pollution energy sources, in order to promote a more efficient, cleaner use of fossil fuels.

¹³ Tong Wu, "China's Industrial Revolution Is Happening on a New Planet", *Conversation*, September 18, 2013

¹⁴ National Resources Defense Council (China Program), "Coal Utilization's Contribution to Air Pollution", *China Coal Consumption Cap Plan and Policy Project*, October 20, 2014

In different ways, China is starting to lead the world not only in developing alternative energy sources, but also in developing cleaner versions of existing technologies.

The third root cause of China's environmental concerns is considered to be the most nuanced, because it does only present itself as obvious in hindsight; the third cause is China's emphasis on economic growth as the only source of the central government's viability. Priority given to economic growth, combined with the absence of adequate safeguards on development resulted in health care problems and environmental damages. Over the last thirty years the central government's role was to ensure economic growth, regardless of other factors, even though the uncontrolled economic growth led the country run into an environmental crisis and a severe healthcare problem with its cause closely related to the damages inflicted by pollutants to the environment.

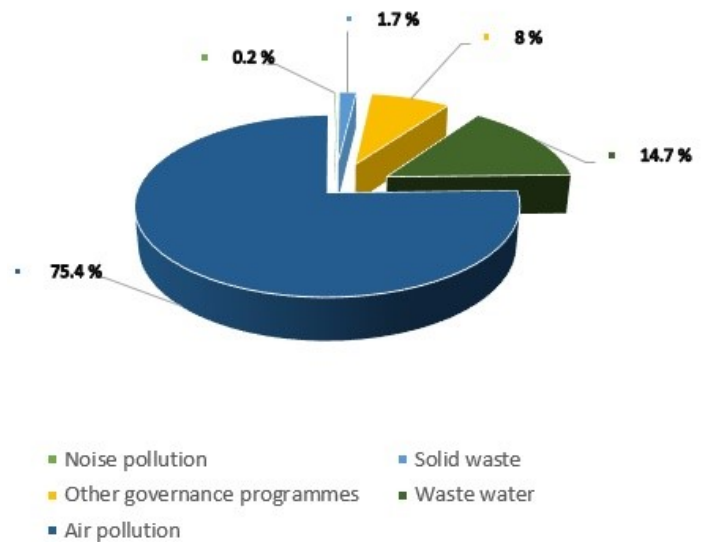
According to estimates, environmental degradation represents a serious threat for China's economic development, since it costs the country nearly 3 to 10 percent of its gross national income. Severe environmental damages influenced Chinese economy not only domestically, but also at international level, since Chinese economic partners (particularly developing countries) face costly environmental burdens for doing business with China.

Environmental crisis did not only bring economic damages to China, but also affected the reactions of the general public towards the government's political decisions, aimed to help solving environmental concerns. Demonstrations have started to proliferate due to the fact that citizens have gained awareness of the health threats and, through the use of social medias, have gained access to the means of organized protest. Environmental protests, both in rural and urban areas, are increasing in frequency year by year. One of the most important changes in China's environmental protest has been a shift, beginning in the late 2000s, from rural-based movements to urban-based movements, making the central leadership start to worry about its legitimacy. Internet has played a leading role in allowing Chinese citizens to gain access to information about environmental damages and to spread those within the country and outside Chinese borders, placing more pressure on the government (Deng, Y. ; Yang, G., 2013; Huang, R.; Yip, N., 2012; Li, L; O'Brien, 2008).

2.2 CURRENT CHINA'S ENVIRONMENTAL DAMAGES

The rapid industrialization of the Chinese territory has a dark side which has caused severe impacts on Chinese population when it comes to environmental situation. While China's economy is at rapid growth, the natural environment is being destroyed. Ecological degradation means that China is involved in serious environmental issues that may influence its overall development.

As environmental damages have begun to enter the eye of Chinese public opinion, the government has started to face environmental crisis, even if Chinese officials have barely paid attention on the environmental problems. In the meantime, the people of China face environmental catastrophes on a daily basis. Among these, mainly three can lead Chinese development to an end:



2.2.1 Bad air quality: air pollution is the most outstanding problem in China, since the pollutants concentration in the country rapidly increases every year. In 2013, the term "Airpocalypse" gained popularity after the severe haze episodes that took place in Beijing that same year. Since the incredibly fast economic growth China has undergone, the pollutant emissions have experienced different patterns. Toxic emissions from coal flooded China's air with harmful pollutants, creating a thick,



Figure 2: Average annual sulphur-dioxide concentrations (World Bank)

gray, shroud of smog engulfing the cities. Due to the dependence on coal, both for Chinese companies and Chinese households, sulphur dioxide emissions have increased; it is not surprising to notice that the majority of ambient pollutants in China's big cities are by-products of coal combustion not only because of the large consumption Chinese people make of coal, but also because of the low quality of the coal itself.

Another concern is about the concentration of oxides and nitrogen (NO_x) which is among the highest in Chinese major cities. The high concentration of NO_x is due to heavy traffic, created by the rapid increase in motor vehicles in the cities. In January 2013, Beijing experienced a prolonged bout of smog during which the concentration of hazardous particles was forty times the level considered to be safe for people by the World Health Organization (WHO). At least 80 percent of China's cities with real-time air quality monitoring systems failed to meet national pollution standards during the first three quarters of 2015 (Greenpeace East Asia report, 2016).

One factor that compounded air problems has been the staggering pace of urbanization, considered a national priority; rapid urbanization has boosted energy demands to power new manufacturing and industrial centres, which in turn have aggravated the pre existing air quality problems. The heavy air pollution brings hundreds or even thousands of deaths each year, causing illnesses like cancer along with respiratory and cardiovascular diseases.

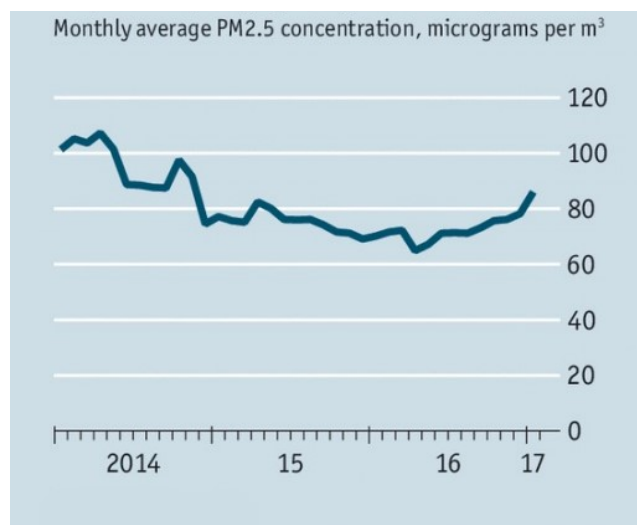


Figure 3: Air pollution Beijing-Tianjin-Herbei region (Greenpeace)

Health issues further resulted in economic consequences such as high medical costs, lower productivity and the deterrence of foreign businesses and tourists.

Recent measurements, however, have shown improved conditions in 2017 for what concerns national air quality, with lower pollution readings in targeted regions and fewer red-alert days. These improvements were possible because of the efforts made by the government in reducing pollution. Unfortunately, further improvements in air quality will result challenging to achieve, since extensive progress will be slowed by institutional, economic, and political constraints.

2.2.2 Water pollution and scarcity: water depletion and water pollution are considered by experts as the country's biggest environmental challenges. China has 20 percent of the world's population, but only 7 percent of its fresh water sources. Water pollution started during the 1950s, becoming worse in the 1970s. Industries along China's major water sources were among the main contributors to polluting water supplies (Wang M., 2007).

Nowadays researches proved that water is so polluted it cannot be treated to make it drinkable and almost one quarter of water within the Chinese territory is so dangerous that it cannot even be used for industrial purposes.

In 2004, China reported 753 incidents of water pollution, for which industrial waste plays the main role, along with the non-degradable and toxic chemicals in the agricultural waste, sewage and solid waste have caused serious damages to both soil and underground water resources (Pang Pengsha, 2004).

In 2014, groundwater supplies for the major part were categorized as "bad to very bad" and more than half of China's key rivers are categorized as "unfit for human contact". It is not surprising that water pollution represents a major threat on public health. When it comes to incidents related to water pollution, industrial waste is a main contributor to it. Industries along China's water sources have polluted water supplies, while lack of waste removal and proper processing have aggravated the problem.

For what concerns water scarcity, the situation of water resources is not different from water pollution; approximately two-thirds of China's 660 cities suffer from

water shortages. Water resource per capita is only a quarter of the world's average (2140 cubic meters per capita), making China be the 110th among the world's poorest countries of low water resources per capita. The situation of water shortage is dramatic, especially in the north and northwest of the country, where we can find less than 20% of total national water resources available in the whole country. Overuse and contamination are the major causes that produced water shortages (Liang Tao, 2007).

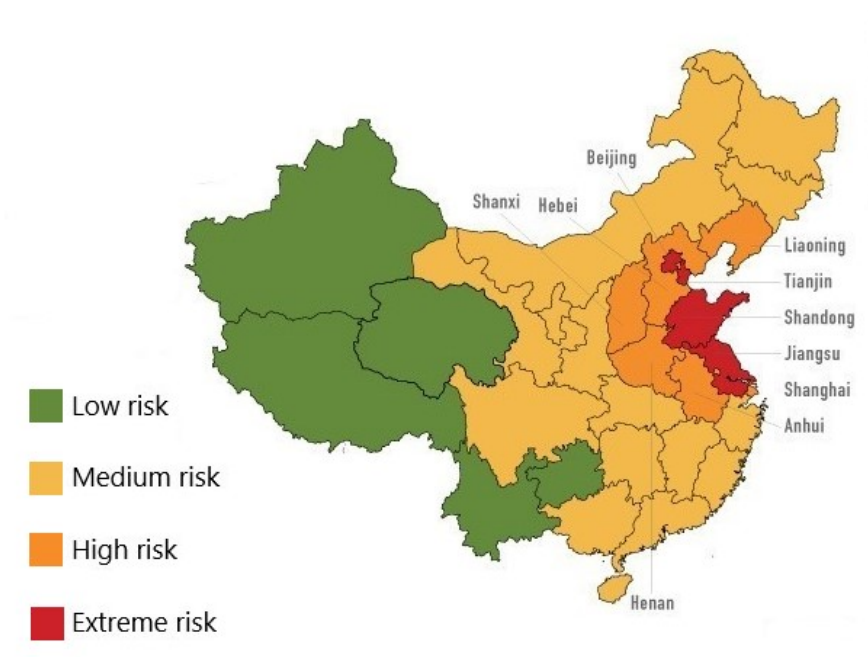


Figure 4: According to the China Water Stress Index, four major Chinese provinces (Beijing, Tianjing, Shandong, Jiangsu) are at "extreme risk" of water shortage (source: Maplecroft)

Water scarcity, pollution and desertification are reducing China's ability to sustain industrial production as well as the production of food and drinkable water for the population.

Chinese government insists that the primary task in water pollution and water shortage prevention is to assure people of safe drinking water, and to take the strictest measures to solve the hazards of polluted water in an effective way.

2.2.3 Energy waste and energy shortage: China is one of the biggest energy consumption countries worldwide, as it is the first in the world for coal consumption and only second to the United States for oil and electricity usage rate.

F. Gerard Adams and Yochanan Shachmurove (2007)¹⁵ suggested that in 2020 the imports of oil and gas will rapidly increase. They stated that, as to increases in motorizations, the imports of energetic sources such as oil, coal, and gas will automatically increase by 2020.

China is at the stage of heavy chemical industry, featuring a rapid increase in energy and resources demand due to the growing industries like machinery and automobile. During the urbanization process, a large number of rural residents rushed into cities, and this meant a growing demand for houses, vehicles, and electrical household appliances. This led to urban energy consumption per capita to be more than 3 times higher than rural areas, marking the beginning of a new consumption structure. At the international level, China has become a so called “large-scale global manufacturing base” as a result, several international high-energy consumption manufacturing companies relocated their facilities across the country. Even though the need for energy supply is increasing, we have to admit China lacks of resources. Economic development is seen as inseparable from the support of resources, meaning that natural resources are in fact a constrain for economic development (Pan Jiazheng, 2006). In short, the rapid growth in Chinese economy has caused severe damages to its environment, causing China to rely on imports of natural resources from other countries because of its shortage. The dependence on imports may make China vulnerable to fluctuations in oil markets and in front of international political instability. As well as weakening China’s position, increases in import prices may automatically affect China’s balance of payments position and domestic prices. Although China has achieved a rapid economic growth, the extensive mode and the high energy consumption make it difficult to protect resources.

¹⁵ *Projections of Chinese energy demands in 2020* (F. Gerard Adams, Yochanan Shachmurove; 2007)

The problem of energy shortages in China has aggravated since 1979, when power shortages only occurred in few cities, especially in the eastern and southern part of the country. In the last twenty or more years, power shortages began to spread across the country, due to the extensive growth of the industrial sector, which alone consumes around 70-75 percent of China's electric power. Due to severe power shortfalls, the entire economy has been stretched too tight. If the current mode of economic growth is not changed in time, it will be extremely difficult to maintain the speed of economic growth.

As we mentioned before, economic development depends on the natural environment and its resources; the relationship between the two is explained as follows:

- (1) The impact of economic development on natural environment: extortion of natural resources and eco-system services and waste discharge into the environment.
- (2) Counteraction of natural environment on human being: negative impact on natural disasters, limitation of natural resources, environmental pollution and ecological degradation.

Environmental issues may influence the economic development in two ways: first, although the possibility for the social benefits to be increased by environmental protection, the costs of private companies will also be increased and their competitiveness in the international market will be degraded. On one hand, as a developing country, China's economy depends on international trade to a certain degree, so the costs of environmental protection will influence its economic development. On the other hand, the environment is becoming more and more fragile, meaning that all the negative effects derived from the limitation of natural resources will determine some limitations to Chinese economic development (Xepapadeas, 2003).

2.3 HISTORY AND DEVELOPMENT OF CHINESE ENVIRONMENTAL STRATEGIES

When it comes to the “birth” of green thinking in China, this is closely linked to its history of economic growth and environmental degradation. The severe aftermaths caused by environmental pollution were the reason why the Chinese central government understood the need to stop the single-minded focus on economic growth and start dealing with the country’s environmental pollution. We may summarize the development process of environmental protection policies dividing these in five main periods, starting from the 1970s and proceeding until today; during the decades, Chinese planning system has promoted different policies in order to deal with environmental damages and environmental pollution. It is essential, however, to highlight the distinction between policies that emphasize managing the aftereffects of pollution and those addressing their causes. Until today, the majority of China’s national policies which are designed to respond to environmental crisis are primarily focused on mitigating the effects of environmental pollution rather than the root causes of such pollution.

Environmental protection (1970s-1980s):

The PRC government started kicking off its environmental protection efforts after having attended the UN Conference on the Human Environment held in Stockholm in 1972. One year later, the first National Environment Conference was hosted in Beijing and represented the first time the Chinese government started considering environmental issues along with economic development. It was in this period that the original Environmental Protection Law was enacted, representing the first legal foundation for environmental protection in China. In 1983 environmental protection was officially labelled as a fundamental policy to which the country must adhere in the long term. The primary principle was the synchronisation of planning, implementation and development of economic growth in both urban and rural areas along with environmental protection in order to achieve economic, social and environmental benefits simultaneously (Li and Li, 2011).

1983 represented the first time Chinese government paid attention to pollution related problems and to the ecological damages that were caused by the excessive economic growth. However, despite all the premises for a successful environmental law, all the attention was focused on the “end-of-pipe” pollution control¹⁶ rather than starting to green the entire economic system. The end-of-pipe (EOP) system was created by Alvin Weinberg; the term describes a pollution-control approach whose main purpose is to clean up the contaminated flows of water or air at the point where those effluents enter the environment. The system was mainly used by “lazy polluters” that did not want to commit themselves to basic changes in environmental protection practices. We may imagine a pipe with chemical waste that discharges its waste into a river; governments and industries thought that the EOP process of treating what came out of the pipe was an easier choice so, instead of going back to the process of producing pollution and trying to change the entire process in order to eliminate the discharges, they chose the easiest path, ignoring the negative impacts it could have had on the environment in the long term.

During the 1970s-1980s, together with the EOP pollution control system, Chinese government started to enact its Environmental protection Law (1979) which is one of the seven basic codes enacted following the lawless years of the cultural revolution. The 1979 Environmental Protection Law (EPL) signed the beginning of the enactment of a full range of environmental laws.

The first 1979 EPL set the foundations for basic principles such as the coordination between economic growth, social development, and environmental safeguard. The law reflected the country’s first approach fighting against an environmental crisis. The EPL established a series of directives with the aim to prevent and eliminate, if possible, environmental pollution.

¹⁶ End-of-pipe (EOP) pollution control: a system where clean-up technology is added to a production or management system, rather than changing the fundamental process itself

Ten years later, in 1989, Chinese central government passed the official version of the EPL, which was not only focused on environmental protection and pollution reduction, but also on people's health safeguard. In the 1989's EPL five new regulations were introduced: first, it was mandatory for companies discharging pollutants above a pre established amount to ask for a discharge permission; second, the principle of environmental responsibility was introduced in order to help the authorities to carry out their tasks by defining responsibilities at local level for every government's organ; third, the urban environmental quality evaluation was established, with the aim to check annually the environmental quality in thirty-two most populated cities across the Chinese borders; fourth, the establishment of the centralized pollution control, which aimed to provide for some gaps at the local level; fifth, the imposition for polluting companies to adequate to the environmental normative before the end of the period of time fixed in advance. Compared to the 1979 EPL, with the 1989 version environmental protection officially became a responsibility at every level of the government; the 1989 EPL did also introduce new fees concerning the environment.

Sustainable development (1990s)

In the 1990s, China changed its traditional development strategy and, as a follow-up to the Agenda 21 of the UNCED in 1992, China was the first country to release a nationwide Agenda 21. This new document was a detailed list of Chinese sustainable development plan. The Chinese national Agenda 21 had the purpose to balance the relationship between social and economic development and environmental protection.

In the same years, after the 9th Five-Year Plan, China changed its traditional development strategy through the implementation of a sustainable development policy and the transformation of the economic growth model. China promoted clean production and embarked on the sustainable development road (Li and Li, 2011).

The guidelines at this stage mainly focused on alleviating the environmental and ecological impacts caused by economic development. The government decided to promote not only the EOP pollution control strategy (proved inefficient in promoting sustainable development) but also clean production strategies in the process of industrial production,

aimed to keep in balance economic growth with environmental stability. This period signed the beginning of green economy thinking in China (Li and Li, 2011). Policies and strategies for preventing and controlling pollution took the initial shape as a coherent system. In order to prevent and control pollution efficiently, the Chinese government drew up three major policies for environmental protection. The laws and regulations on environmental protection, drew up and promulgated by the Chinese government, included provisions on the prevention and control of industrial pollution. Local governments and municipalities worked with the central government in order to push for the set of rules to protect the environment, and worked with their actual conditions to prevent and control industrial pollution.

Harmonious relationship between man and nature (2000-2006):

This period of time has to be considered the green economy's exploration stage; during the beginning of the 21st century, China faced severe environmental crises. This was the period when the ancient Chinese ideal of harmony between man and nature regained popularity and in 2002, it was integrated into the slogan of building a "well-off society"¹⁷. The well-off society's main goals were the development in a sustainable way, the improvement of the ecological environment, the enhancement of resources efficiency, the promotion of a harmonious relationship between man and nature, and a push towards a new development pathway, which had to be more productive, more prosperous and more ecological (16th National Congress of CPC). The president Hu Jintao in 2005 first advanced the idea known as "Two-type society"¹⁸ that was later incorporated in the 11th Five-Year Plan and considered necessary for building a harmonious society. In these years, China's green economy development accelerated quickly, and environmental needs were incorporated into national-level plans and strategies. The national 11th FYP included not only targets concerning economic growth, but also issue related to population, energy and pollution.

¹⁷ The term "well-off society" (in Chinese 小康社会 xiao kang she hui) was first used by late Chinese Leader Deng Xiaoping. The term is used to define a society in which all people lead a fairly comfortable life.

¹⁸ Two-type society: a circular economy and a resource-saving and environment-friendly society.

Among the concerns were energy security, due to the increased amount of oil and natural gas China was forced to import. Together with the national FYP, provincial and local governments prepared more detailed five-years plans. The 11th FYP marked a departure from the previous plans; from this plan we see an increased focus on energy and environmental issues. However, the targets for energy and the environment were ambiguous and required great effort on many levels to be achieved. Two major policies were the Small-Unit Shutdown Policy and the FGD¹⁹ Installation Policy.

Scientific outlook on development (2003-2012):

Environmental concerns became mainstream within China's development strategic thinking. The president Hu Jintao in 2003 put forward the concept of "scientific outlook on development" (SOD)²⁰. China's reforms and processes adhered to a people-oriented principle which aimed to build a comprehensive, balanced and sustainable development model. One of the projects for the achievement of a balanced development was the balance between urban and rural development, together with the cross-region development, the economic-social development and obviously the man-nature relationship. The SOD became a long-term guiding principle of the Chinese Communist Party (CCP). It was in this period that the green economy agenda was implemented into the country's development strategy, while new green policies flourished across different sectors.

Ecological civilisation (2007-present):

The period can be considered as the "great-leap-forward" of Chinese green economy, both conceptually and implementation-wise. On one hand, the term ecological civilisation made its first appearance during the 17th National Congress of the Communist Party; it was part of the process to build the well-off society. In 2013, during the 18th National Congress the concept received political attention and was included into the national development process,

¹⁹ FGD: Flue-Gas Desulfurization, it is the removal process of sulphur dioxide (SO₂) from flue gas emissions, produced by the combustion of fossil fuels in many industrial processes such as gasoline refining as well as cement, paper, glass, steel, iron and copper production.

²⁰ Scientific Outlook on development (SOD): in chinese 科学发展观 (Kexue fazhan guan); it represents a political vision proposing a balanced and sustainable model of development. It was put forward in 2003 by the former president Hu Jintao.

with economic, political, cultural, and social construction. On the other hand, when it comes to the implementation, China made huge progress. In 2008 the stimulus package of 4 trillion RMB was implemented; a significant share was earmarked for green investments with the intent of facilitate the growth of China’s renewable energy sector and green jobs. Most recently, the central government has revised its economic targets and has also revised its environmental law, reflecting a growing commitment to greening its national economy. The selling point of ecological civilization is the aspect called “institutional Innovation”. Institutional innovation basically means the inability of China to offer a model for other countries to replicate the approach to environmental governance. Institutional innovation basically implies a experience-based exploration aimed to test different options of institutional setup. This means that the Chinese state is not ready yet to diffuse an effective environmental governance to other countries. Ecological civilization is used as a reinforcement of a symbiosis between economic development and environmental protection, which means that it can be considered a more comprehensive expression of sustainable development.

Environmental protection 1970s-1980s	Sustainable development 1990s	Harmony between man and nature 2000-2006	Scientific development strategy 2003-2012	Ecological civilisation 2007-Present
<ul style="list-style-type: none"> •End-of-pipe pollution control •nascent awareness of environmental protection •The original Environmental Protection Law enacted 	<ul style="list-style-type: none"> •Goal to alleviate negative impacts of economic growth •Clean production and end-of-pipe control •Agenda 21 released as China's first sustainable development plan 	<ul style="list-style-type: none"> •Harmony Between man and nature •Circular economy •Resource efficiency and environmental concerns appear in the official development rhetoric 	<ul style="list-style-type: none"> •Environmental sustainability as a central piece of China's development thinking •Balanced and people-oriented economic development •Various green sectoral policies 	<ul style="list-style-type: none"> •Investment and stimulus package for the renewable energy sector •green jobs •Quality of economic growth over speed •Ecological civilisation

2.4 CHINA'S MAJOR MACRO-LEVEL POLICIES ON ENVIRONMENTAL SUSTAINABILITY

Although its economic development has led China become the most important economic power in the world, when it comes to environmental sustainability the country still lags behind a large number of developed countries to the point that some people consider China more a developing country than a developed one. The central government throughout the decades has faced severe problems concerning the environment, trying to handle the environmental question as carefully as it could. In the 21st century we saw the very first attempt made by the Chinese central government to plan and implement policies that will lead in the future to a better environmental situation for the country (Gore, 2011).

Three major macro-level policies have been issued by Chinese government:

1. The national Five-Year plan
2. The amended Environmental Protection Law
3. The national power sector reform

The political organs involved in these three major policies are the National Development and Reform Commission (NDRC), and the Ministry of Environmental Protection (MEP) for the policy formulations; the central government's leadership (the Chairman, the Politburo standing committee and the State Council) for embedding the green agenda into macro-level planning.

2.4.1 The National Five-Year Plan (FYP)

Five-year plans do not only represent a central piece of Chinese ideology, but they also play an essential role in defining tasks and priorities in the country's development path since the foundation of the PRC in 1949. The FYP embodies the concept of processing step by step, as the government is supposed to reach the targets listed in the plan in a five years period of time. After following soviet-style economic models, in 1953 the communist party implemented the very first Chinese five-year plan, which was entirely dedicated to accelerate the national industrial sector through the use of specific tasks and objectives expected to be reached in five years.

From 1953 until these days Chinese people saw national development changing its way according to the various plans adopted by the central government. If in the past the focus was the economic development above environmental and social stability, nowadays it has shifted towards a more sustainable model, meaning that more attention has been paid when it comes to avoid environmental degradation, ensure people's safety and provide them with basic needs such as clean air and water, while at the same time maintain the economic growth rate at high levels (Hilton, I., 2009).

China's 12th FYP was drawn up in 2010, and represented the blueprint for China's development from 2011 to 2015. Although the 12th FYP represented a starting point from which environmental policies became more and more real in practice, China demonstrated its long-term political will in response to climate change back in 2009, during the global climate-change summit held in Copenhagen. In fact it was from 2005 that Chinese central government decided to implement long-term strategies to reach environmental sustainability goals with the 11th FYP.

During the 11th FYP China met its energy-saving and emission-reduction targets; next, in the 12th FYP China took further steps along the same path by setting and implementing more energy-saving and emission-reduction goals. The 12th FYP represented the first plan for which the main theme was green development. Green development strategy had six fundamental supporting pillars: strengthening conservation and management of resources, developing the "circular economy"²¹, enhancing environmental protection, promoting ecological protection and restoration, and strengthening water management and disaster prevention and alleviation.

The 12th FYP targets were also more apparent than in the previous plan, the number of resource and environmental targets accounted for 33,3% of the total in the 12th FYP, more than the 27,2% in the 11th FYP (Boyd, 2015; Copsey, 2015).

²¹ Circular economy: the aim of circular economy is to redefine growth, focusing the attention on positive society-wide benefits. The circular economy builds economic, social, and natural capital, underpinned by a transition to renewable energy sources.

For the first time, the 12th FYP aimed to reform resource pricing and establish a brand new system of payment for environmental services; it also put forward an “ecological security” strategy, which required a rigorous enforcement and the use of green buffer zones in areas where development was limited or banned in order to protect vulnerable land.

The plan’s aims for the GDP were of 7% annual growth, so much less than the 10% planned in the 11th FYP, but the new proposal was the “inclusive growth” which can be explained as rebalancing the economy in order to spread the benefits in a more equitable way, alleviating social inequalities and protecting the environment. To reach the goals the plan listed, Chinese central government expected that investments in environmental protection exceeded 3 trillion RMB over the five-year period. The majority of the investments were supposed to be used to reduce the reliance on fossil fuels (Boyd, 2015; Copsey, 2015).

The 13th FYP, the plan that will guide the country’s development from 2016 to 2020, marks a peculiar stage of China’s society. After more than thirty years of unstoppable growth, China’s economy has now reached a phase of what we may call “maturity”. The country is in a medium-high growth phase in its path towards becoming a high-income economy and now faces a relative slowdown in growth (1980-2014 data from the “China statistical yearbook” series, 2015). While relative growth rates are slowing down, the absolute volume of annual economic growth is still considerable (Cai Fang, 2016). This persistent economic expansion is a sign of a large demand for domestic investment to feed the growth. The economic structure in China has shifted from an industrial structure to medium-high end of the value chain, and so the tertiary sector now holds the largest portion of national GDP, meaning that it has established itself as the most powerful driver of growth in the economy. Due to the changes occurred within the philosophy of Chinese development, first merely concerned with the pace of growth and now more focused on the effective quality of growth, green development and the advancement of the Ecological Civilization are among the most crucial strategies and tasks of the 13th FYP. The plan is supposed to address several sustainability challenges, including climate change, air pollution, water scarcity, urbanization, and transportation.

The main targets the plan must achieve in five years are:

- 1 The creation of new and innovative concepts and methods for environmental governance;
- 2 The implementation of stricter environmental protection system;
- 3 An increased accountability for polluters;
- 4 A system of joint governance by government bodies, businesses and the general public;
- 5 An improvement of the general environmental quality.

China plans to boost its economic growth by 6.5% per year over the five years period; the growth will come from the services and a more innovative manufacturing system. These two sectors generally have lower air pollutant and greenhouse gas emissions than traditional domestic sectors, such as heavy industry and infrastructure construction. With the 13th FYP China's brand new target is to reduce by 18% the carbon intensity levels registered in 2015, estimating to reduce its carbon intensity by 48% from 2005 to 2020. The plan for the first time includes quantified guidance on energy consumption control, which seems to be a powerful effort towards limiting energy consumption, since it states that China must limit energy use to 5 billion tons of standard coal equivalent. The efforts China puts on achieving its targets by 2020 are driven by strong national interests, and recently national leaders recognized that clean energy may include benefits not only for citizens safety, but may also bring benefits to the national economic development.

China has already been able to make substantial progress under the 12th FYP, especially regarding energy intensity (down 18,2%) and carbon intensity (down 20%) (Boyd, 2015; Copsey, 2015); from 2014, coal consumption levelled off and output in heavy industries like steel and cement begun to decline. Furthermore, investments in clean energy (wind and solar power especially) increased so much that the country was the global leader in solar capacity in 2015.

Despite the high commitment and the progress that has been made, other aspects of the Chinese environmental crisis continue to generate concerns. Ecological and environmental decays have become a serious obstacle for Chinese economic growth and social stability, and so a low-carbon development may represent one of the best way to solve environmental crisis while achieving economic targets and social equality, but it does not necessarily means green growth or healthy citizens just because the attention was and still is mainly focused on energy and carbon targets. In order to achieve social stability and fight against environmental damages created by uncontrolled economic growth, Chinese leaders must be able to design strategies to which citizens at all levels must adhere. The government must also create a proper punishment system and not just rely on a fee paying system. Incentives for going green must be provided by both the government and the private sectors, including domestic and foreign enterprises. Joint commitment among the government, industrial sectors at all level, citizens and foreigners is considered essential to reach sustainability targets in 2020.

2.4.2 The newly amended Environmental Protection Law (EPL)

The environmental degradation caused by China's economic development during the last thirty years has been considered under any precedent and it is the direct result of China's heavy reliance on coal for more than 70 percent of its energetic needs (Xu, 2014). As a consequence, cities like Beijing are covered in thick smog, which are harmful to its citizens, and more than 40 percent of the country's rivers and lakes are heavily polluted (Yang, 2012). It has been estimated that environmental degradation costed the country almost 9 percent of its GDP (Xu, 2014).

The damages created by uncontrolled and unregulated pollution has become a social issue, as protests have began to spread due to the growing skepticism on the government's ability to hold companies accountable for environmental violations (Liu, 2013). To address environmental degradation, the Chinese parliament amended the 1989 Environmental protection Law (EPL) in April 2014, which came into force in January 2015; the law represents a milestone in addressing several environmental issues China faces by providing a solid legal basis for more environmental work.

It is the first amendment to the EPL, which originally came into force almost thirty years ago; as an upgrade for the older version, the new law provides five key points:

1. It provides the legal basis for obligatory environmental protection, without compromising economic development. The law stipulates that the country should pursue economic and social development while at the same time safeguarding the environment.
2. Under the previous EPL, local officials were able to allow polluting companies, often with government connections, while being awarded with favourable evaluations. The new EPL establishes a monitoring and evaluation system for government officials; in order to encourage local authorities to enforce penalties, and to reduce opportunities for conflict of interests, the law emphasises offices' accountability for lower government offices' environmental performance, and incentivises local governments to carry out environmental protection work. With this system officials may be monitored and evaluated according to the prescribed environmental performance targets. Local level officials who fail to publish, or publish false reports, are subjected to fines, demotions, dismissals, and criminal prosecutions. If accountability mechanisms are implemented, public disclosure will provide greater information transparency which will expose companies.
3. Local governments have the authority to impose daily accruing fines on companies (PRC, 2014, Art.59). Prior to the revised law, environmental authorities could only impose pre-determined, one-off fines that resulted more cost effective than investing in mitigation measures recommended by the Environmental Protection Bureaus. The amended law now enables these bureaus to seize facilities, equipment, and in serious cases allows local governments to seize business operations.

4. It stipulates information disclosure and public participation. In order to promote transparency, China's regulatory system requires enterprises to disclose environmental management information, so that information may be released by county governments to the general public. The new amendment grants the right to citizens, legal persons and other organizations in China to know, participate, and supervise government offices and polluting companies. In the past, compliance with the environmental regulations has been weak for several reasons, including corruption and lack of enforcement mechanisms able to hold companies and governments accountable for violation of any regulation.

With the revised law, all environmental departments at all levels are supposed to provide environmental information and improve the public participation process. The law also affirms that key polluting companies must release their emission information that include name of the pollutants, emitting methods, density and amount of pollutants, excessive emission, and existing pollution prevention facilities.

5. It lays the foundation for China's environmental public interest litigation system. The most heated question around this topic regarded the eligibility for initiating lawsuits. The new EPL expands the scope of NGOs eligible to file lawsuits against polluting companies. Eligibility includes non-governmental organisations that are registered with administration at the city level and with an active role in environmental public services for more than five consecutive years. Prior to the new EPL, only government-organized NGOs were qualified to file lawsuits against polluting companies and, as a result, environmental disputes were most of the time resolved using informal means, which obviously undermined public transparency.

Although the new EPL seemed to solve major concerns which were not taken care of by the precedent law, some uncertainties have not disappeared yet: one of the most relevant controversy revolves around the commitment by, and ability of, local governments to implement the ambitious duties the law prescribed; compliance with environmental regulations by enterprises is checked through environmental inspections carried out by inspectors who often have conflicting interests and inadequate resources to develop

environmental protection programs. In addition, there is a lack of judges with a proper environmental competency who often are unwilling to hear public interest lawsuits.

Local levels corruption has always hindered the enforcement of national laws because of the weak and often conflicting accountability institutions. Due to the weak accountability institutions, and with the frequent use of social connections (*guanxi* 关系) which create strong conflicts of interest (OECD, 2006). Local governments also lack the ability to fund capacity building efforts, due to revenue shortage caused by inadequate revenue transfers from central government to develop environmental programs (Zhen, 2014). In this way, technological infrastructure needed to release environmental information has not been built. Resources shortage have also resulted in the failure of some provinces to meet pollution reduction targets.

Comparing the newly amended EPL with its predecessors we may come to some conclusions: the 1989 EPL provisions were vague and aspirational, since environmental degradation had not yet reached the alarming levels found today throughout the country; the provisions simply contained general requirements for things such as environmental impact assessment, the levying of fees, and pollution control measures. Nowadays, although the environmental challenges China has to face, the new amendments give officials and the public powerful tools to fight the so called “war of pollution”. A meaningful example of a powerful tool may be, as environmental consciousness increases, people begin to turn to courts to advocate for their rights, even though pollution victims have often found difficulties in seeking redress through the legal system (NG, 2012). Although the implementation of public litigation have encountered practical difficulties²², some cases handled by NGOs and public interest lawyers, even if limited, are influential. Since the Chinese government has recognised the value of environmental litigation, sectors of the government are exploring the possibilities to establish some forms of public interest litigation, but yet the form of this litigation remains unclear. Anyway, a system in which both environmental law and public involvement work together played a constructive role

²² Over 300.000 environment-related petitions were received between 2006 and 2010, but less than 1 percent were resolved through the courts.

in environmental protection in several countries, included the US, and so there are few doubts it would result successful for China's environmental crisis. It is sure to say that Chinese central government must invest more for hiring and training environmental protection workers, ensure that local governments have local environmental bureaus with appropriate equipment, and assist in developing infrastructure to guarantee that environmental standards will be met in the near future. In the years to come, future monitoring of companies will be highly advised. Companies should prepare for information scrutiny by environmental protection bureaus regarding environmental pollution management systems. As China's is considered the main exporter of manufactured goods, companies should as well encourage suppliers and other business partners to adhere to the regulations. The central government should pay close attention on continued monitoring of actions and events to enforce on the new EPL. The increased awareness about environmental law updates and the progress with China's anti-corruption efforts may have a significant impact on the enforcement of environmental protection policies and programs (Zhen, 2014; Huang, 2014).

2.4.3 The national power sector reform

Since 1978, as a reaction to the open-door policy, China assisted to a rapid economic growth which brought a consistent demand for energy supply. Since then, the energy sector went through a remarkable expansion. In the 1990s China adopted a series of structural reforms, market incentives, and decentralisation policies aimed to attract foreign investments in the energy sector. Nowadays, China is the world's largest producer of coal and electricity and is as well the major exporter of coal and importer of oil. For instance, in 2016, the country accounted for 48,9% of the world's coal consumption, while its power plants contributed 24,9% to global power generation (China Statistics Press, 2003). That may explain the reason why, for both employment and industrial output, the energy sector is seen as vital for China.

When it comes to energy sources, coal remains the country's dominant source of energy, also due to the fact that it is the most produced and exported within China (China Statistics Press, 2003).

A problem related to coal is the regional imbalance between production and consumption: essentially, the vast majority of coal production areas are situated in the northern regions, while the biggest consumer of it are located in the southern regions. This of course has had implications on costs for transporting it and, as a result, has affected the prices (Todd, 1994; Zhang, 1994).

China's second most important energy source is oil. From the 1960s and 1970s China became a huge producer of oil and its production expanded rapidly before slowing in the 1980s, when the country started to suffer a drastic drop in oil export, resulting in less earnings and a dramatic increase in prices. Since 1990s, despite the increase in oil demand, China faced a stagnant oil production situation; from 1993, the slowing production of oil caused China to shift from being an oil-exporting country to being an importing country. From that moment, China's dependency on oil has increased at a rapid scale over time.

As many other countries prior to reform, China organized its power sector in a single vertically integrated utility, which was exclusively owned and organized by the central government of the PRC (Xu, 2002; Andrews-Speed, 2003). The first changes to the vertically integrated utility structure were made in 1984, opening up generation to investment by third parties (mainly provincial and local governments, then domestic and foreign companies) outside the central government. Nowadays, the most recent changes are aimed to set the scene for the development of competition between generators in order to improve operational efficiency and lower prices (OECD; IEA, 2006).

After decades of rapid increase in energy generation capacity, for the first time, in the late 1990s power supply exceeded power demand; the oversupply worsened in 1997 due to the inertia in investments and the reduction in power demand as a consequence of the Asian financial crisis (Hernandez; Li, 2018). By 2002, the power sector reform started with the release of a document entitled *Power System Reform Scheme* (document n.5). The goals for the reform were to break the institutional monopoly in order to introduce competition within the power sector, improve the efficiency of the sector, protect the environment, and adopt better regulations (State Council, 2002).

Although the premises for the Document n. 5 to succeed were high, the reform did not fully realise its initial goals. Three are the main reasons behind the failure of the 2002 reform:

1. **The power demand growth rate was underestimated:** the power demand started to increase in 1997 and since then it got worse. The central government decided to suspend the approval for construction of coal power plants from 1998 to 2000. After 2000, the annual rate of power demand was predicted to increase of 5%, but in reality it grew to over 15%, as a result of the Asian financial crisis. This signed the shift from the 1997 power oversupply to the 2003 power shortage. So, the focus shifted from improving power efficiency to accelerating power construction, in order to supply the high demand of power. The driving force of the 2002 reform was left behind as it was considered a low priority (OECD; IEA, 2018).
2. **Provincial governments played a resistance role in approving the reform:** since the late 1980s, provincial governments had the responsibility for power planning, authorising, administrating, and financing power projects. For local governments retail pricing was considered a tool for adjusting local economic development. Because of the role provincial government had gained, they were reluctant to cooperate in the reform, because it meant losing local control on the power sector, giving up their interests and causing social and economic instability (OECD; IEA, 2018).
3. **Grid companies had a unique role:** grid companies²³ were acting as single transmission and distribution operators, working with a single buyer on the wholesale side and a single seller on the retail side. Provincial grid companies in the long run tended to fund their own interests due to the fact that the regulation was not effective in promoting interprovincial and interregional trading. Also, transmission and distribution tariffs were not separated, making very difficult to have an accurate access on real investments and operation costs (OECD; IEA, 2018).

²³ Grid companies: power generating systems comprised of generating plant, transmission lines, substations, transformers, and distribution lines.

Several years of development went by, and China was able to achieve many results in the power sector. Compared to the rest of the world, China has more operating capacity and more transmission lines; the country has a diversified power system structure, generated after the destruction of the vertically integrated utility system. At the same time, power pricing has been improved and new market mechanisms have been explored (Hernandez; Li, 2018). Although the achievements, remaining problems still need to be solved in order to achieve a more efficient and environmentally-friendly power system.

In 2015, the State Council issued an official document entitled *Opinions on Further Deepening the Reform of Power System* (Document n. 9); the document was a symbol of Chinese new round of power sector reforms (State Council, 2015). The objectives listed in the document were to create market-based prices for the wholesale and retail sides to develop market mechanisms, establish a separate and transparent transmission and distribution tariff, expand interprovincial and interregional market, enhance government regulation, and improve power planning. Among the document issues, pricing reform is the most crucial (OECD; IEA, 2018). Concerning pricing, four key issues must be taken in consideration: the establishment of a separate distribution and transmission tariff; wholesale energy prices will be decided by negotiation between generators and consumers; smaller customers will be able to purchase power at the market price rather than at the retail price issued by the central government; cross-subsidies will be better handled to avoid that some customers may pay more for power while others pay less because of higher costs of electricity in some sectors rather than others (OECD; IEA, 2018).

In Document n. 9 a special attention is posed on administrative planning when it comes to power generation and power construction planning. In the future, power demand will be transferred to mid- and long-term contracting, and the amount and capacity of direct contracting will be excluded from the administrative plan. For power construction planning, provincial governments will keep the responsibility to allow power construction (OECD; IEA, 2018).

The 2015 reform is different from the 2002 one: in 2015, provincial governments implemented reforms instead of the central government; in 2002, provincial governments were the ones to be reformed and had to give up part of their jurisdiction, while now provincial governments have the authority for establishing distribution and transmission tariffs, promoting direct contracting, founding power exchange institutes, and constructing power markets (Hernandez; Li, 2018).

Three years passed since the launch of the Document n.9 and among other policies, the ones derived from Document n.9 resulted in several achievements:

- Clarification of transmission and distribution tariff
- Establishment of trading centres and regulatory committees
- Establishment of mid- and long-term provincial and regional power markets
- Appearance of retail companies

The fact that major improvements have been made possible, it does not mean that challenges are over. Actually, China's power sector is still going through major changes because of the challenges the Chinese power sector is facing in shifting towards a market-oriented, low-carbon and cleaner system. For this reason, a new power reform is being planned and aims at transforming electricity supply by creating a flexible power system based on market principles.

The challenges the new reform may face are the following:

- System planning
- Introduction of market competition to reduce power generation costs
- Introduction of market competition at the retail to offer multiple choices to final consumers
- Renewable energy development and integration

To be able to respond to these challenges, the government may use innovative approaches and learn from experiences from other countries. This may include changing policies and regulations, and may also require enhanced power system planning and operation (OECD; IEA, 2018).

2.5 CHINA'S SPECIFIC POLICIES FOR GREENING THE ECONOMY

Although the last forty years China's coal-fired economic development has helped the majority of the population to fight against the poverty, it has also turned the once-agrarian nation into the world's most polluted nation and the biggest consumer of energy and the biggest emitter of greenhouse gases (Rosenthal, 2008). Those dramatic consumes are the main reason behind the climate change in China, which is seriously damaging the citizens' quality of life and mining not only the country's economic development, but also the entire population's well-being and health conditions.

Chinese attempts to fight against adverse climate change conditions have not proved to be completely successful due to the fragility of the country's ecological environment. Since 2012, during the 12th FYP period, the Chinese government took serious steps toward the creation of new specific policies aimed to address climate change.

Green production: Considered the "factory of the world", China is still intensely struggling to clean up the national industrial production. The NDRC, the MEP, and the Ministry of Land and Resources have started to transform and upgrade traditional industries by enhancing the evaluation and examination for energy saving, and improving the assessment of environmental impact and the pre-examination of land resources for construction, in order to control the launch of old-style industries with high energy consumption and high pollutants emissions (Geall, 2013).

Several policies have to be considered as a good launching pad for the so called "Environmental Industries"²⁴ (UNEP 2013): although the sector has burgeoned since the 1980s to cope with environmental problems, it was only from 2012 that the Chinese government started supporting the development of strategic emerging industries issuing the Development Plan for National Strategic Emerging Industries during the 12th FYP. The development plan charts the road map for seven strategic emerging industries: energy conservation and environmental protection, new-generation information technology,

²⁴ Environmental Industry: it refers to industries which improve environmental conditions. China's environmental industry encompasses environmental protection services, waste recycling products and ecological conservation services.

biology, high-end equipment manufacturing, new energy, new materials, and new-energy vehicles (UNEP, 2013).

For each of these seven strategic industries, it mapped out a sequence of specific plans and more than 20 areas of science and technology, while at the same time issuing new policies and measures, such as the 2012 Strategic Emerging Industries Categories. The local authorities of 26 provinces and cities, including Shanghai and Beijing, issued plans and guidelines on the development of such emerging industries (UNEP, 2013).

It is essential to say, however, that environmental industries alone were and still are incapable of managing the national climate change threat; the Chinese government had to establish an entirely new energy structure aimed to promote the shift toward the reduction of carbon emissions and the promotion of renewable energy sources. The reduction of energy intensity²⁵ has been a key government goal over the last decade. Since 2012, the government has invested billions of yuan in supporting high-efficiency, energy-saving projects, technologies, models, and industries.

NDRC collaborated with the Standardization Administration, issuing over sixty energy saving standards since 2012. Standards include limiting unit product energy consumption for high consumption industries, and fundamental standards for energy saving. Ten industrial standards were approved and issued and included the Regulation on Energy Saving Technology in Heating Systems in Towns. New regulations concerning new energy vehicles were issued by the Ministry of Industry and Information Technology and other ministries, while the Ministry of Transports issued new limits set on fuel consumption, attempting to improve energy saving projects and the systems of new energy vehicles.

Since 2012, while promoting new energy saving standards and regulations, the Chinese government continued to promote low carbon projects in a form of “pilot projects” in a selected group of cities. The pilot projects helped accumulate a certain experience with low-carbon development and laid the foundation for dealing with climate change in a proper way.

²⁵ Energy intensity: i.e. energy consumption per unit GDP

The government decided to nominate 29 provinces and cities, among those Beijing, Shanghai, Hainan province and Shijiazhuang, for locating low-carbon pilot projects; those areas were found to be successful locations for the establishment of green, environmentally friendly industry systems. The areas positively advocated low-carbon lifestyles and consumption models. Seen the positive results of pilot projects in locations such as Beijing, Tianjing, Shanghai, Chongqing, Hubei province, Shandong province and Shenzhen, the pilot locations expressed the desire to push forward the pilot programs by implementing rules, and researching and setting up calculation approaches and standards for carbon emissions. Since then, all provinces, autonomous regions and municipalities have experienced and practiced low-carbon development, according to their local characteristics, resulting in a development of many different experiences and approaches. As examples, Anhui province has arranged special funds to support the creation of low-carbon demonstration bases located in nine industrial parks and communities located within the province; Sichuan province designated Chengdu, Guangyuan, Yibin, Suining, Ya'an as provincial-level pilot low-carbon cities, with the aim to explore the low-carbon development model with local features; Shandong province designed specific funds for low-carbon development, such as funds for construction energy conservation and green building development, new energy industries, and new energy vehicles.

Renewable energies: renewable energy has a crucial role in China's green economy policies and is a well known subject at international level. In 2005 the "Renewable Energy Law" outlined a variety of financial incentives used by the government to invest on and developed the renewable energy sector. Under the NDRC, China's CRED designed a new law called the "Renewable Energy Development and Utilization Promotion Law". The main goal of this law is meeting short-term energy needs while developing stronger long-term sustainable development objectives. The law is designed to reduce air pollution, safeguard public health, protect the environment, and provide power to both urban and rural areas as well as mitigate climate change (National Renewable Energy Laboratory, 2004).

Three are the categories on which the renewable energy development falls. Chinese government establishes the first two levels of policies on renewable energy, then local governments, including provinces, municipalities, and counties, establish the third and last level of policies. The central government has also the task of monitoring local governments and giving them directions (NREL, 2004).

The first-level policies have a primary scope: to direct and guide through the development of renewable energy systems; these policies include speeches of state leaders about the development of renewables and the Chinese government's standpoint on the global environment. Example of first-level policies are: the 1992 China Agenda 21; the 1995 Electric Power Law; the 1997 Energy Saving Law (NREL, 2004).

The second-level policies are aimed to specify targets and development plans; central and local governments use their policies on renewable energy as an attempt to standardise the different viewpoints regarding the objectives and the directions of renewable energy development. Examples of second-level policies are: the 1996 9th FYP and 2010 Plan on Energy Conservation and New Energy Development by the State Power Corporation (NREL, 2004).

The third-level policies mainly are practical and specific incentives and guidelines, which outline specific measures supporting the development and the use of renewable energy sources; these policies' aim is to provide concrete support to help developing renewable energy in the early growth stages. Examples of third-level policies include: the 2001 Electricity Facility Construction in Non-Electrification Townships in Western Provinces of China (or Township Electrification Program) by SDPC and MoF (NREL, 2004).

Since 2005, the renewable energy program agendas include these objectives:

- Electricity production goals: reach 13 Metric tons of coal equivalent (Mtce) of electricity using renewable energy sources only, with corresponding CO₂ reduction and SO₂ reduction.
- Remote power: provide power to remote areas across the country for 1.3 million families, and provide employment for more than 200,000 people.

- Solar water heating: increase annual solar water heating, with the aim to have 5-10 large-scale enterprises with internationally competitive ability.
- Solar electricity: increase the production capability of solar cells to 15 megawatts each.
- Wind power: increase installed capacity of grid-connected wind power to 1.2 gigawatts, in order to meet domestic market demand.
- Geothermal energy: increase the production of geothermal energy to 20 million square metres.
- Bioenergy: increase gas supplies derived from efficient bioenergy, including biogas from industrial organic waste water, farm waste, and biomass gasification system.

In 2013, China invested USD 56 billion in renewable energy sources development, resulting in China leading the hydropower generation²⁶, nuclear energy generation²⁷, and wind power generation²⁸ (NREL, 2004).

Despite the massive investments on renewable energies, China is still very dependent on coal, consuming more than half the world's coal output and being the major contributor to global greenhouse gas emissions over the last decades. One good news however says that coal consumption, although slowly, is gradually slowing down. The proportion of coal in China's energy mix has also decreased, due to the increased proportion of clean energy (hydropower, nuclear power, wind power). In towns such as Beijing and Tianjing, which are intensive coal users, the total quantity control for coal consumption has been pushed forward (NDRC, 2012).

Circular economy: China's traditional economic growth model was and is still based on industrial production, relying on high investment and high consumption of resources; this has resulted in a contradiction between limited environmental resources and economic development. Under the pressure of limited resources, China is forced to change its development system and has found in circular economy a new model aimed to improve

²⁶ 220 million kW

²⁷ 29 million kW

²⁸ 91.4 million kW (cumulative)

resource-utilisation efficiency and solve the contradiction between limited resources and growth. Circular economy was favoured by the former President Hu Jintao; it was rooted in the industrial ecology theories and environmental policies of European countries such as Germany and Sweden. In 2005, the State Council issued “Several Opinions of the State Council on Accelerating Circular Economy Development”, marking the starting point from which China embraced the circular economy concept. In 2008 the “Circular Economy Promotion Law” was issued by the Chinese government, and in 2009 the circular economy concept was rendered into the “People’s Republic of China Circular Economy Promotion Law” (State Council, PRC, 2013). The concept of circular economy refers to the reduction, reuse, and recycling activities in the production, circulation, and consumption of goods and services. Circular economy in China has two main purposes: first, to solve the scarcity of resources by improving energy efficiency and reducing the consumption of energy and natural resources; second, to reduce gas emissions by mitigating pollution caused by the rapid industrial development (Yuan; Bi; Moriguichi, 2006).

Circular economy in China has experienced mainly four stages:

The first stage (before 1992), characterised by comprehensive utilisation of resources. China accumulated experience in establishing a system of waste recycling and comprehensive utilisation of waste gas, waste water, and waste solid. The main purpose of the resources utilisation was to remedy the shortage of products and increase resource supplies (Li; Lin, 2016).

The second stage (1991-2002), characterised by clean production. Environmental pollution control mode shifted from end treatment to source prevention, promoting the increase in resource utilisation rate and reduction in pollutant emissions, laying the foundation for the development of circular economy (Li; Lin, 2016).

The third stage (2002-2008), known as a pilot stage of circular economy. In 2002, the State Environmental Protection Administration (SEPA) launched the first circular economy programme; Guiyang city and Liaoning province were selected to be China’s first circular economy pilot areas.

In 2005 and in 2007, Chinese State Council launched the first and second sets of circular economy pilot projects to be enacted in selected provinces, cities, sectors, areas, and industrial parks (Li; Lin, 2016).

The fourth stage (from 2009 to our days), characterised by the rapid development of circular economy. The “Circular Economy Promotion Law of People’s Republic of China” was implemented on January the 1st 2009; this was the sign circular economy entered China’s legislation process. Circular economy has covered 27 provinces and a variety of industries, since the rapid increase of pilot projects and scope. The trends now are revolved around the implementation of circular economy across the country (Li; Lin, 2016).

China’s circular economy consists of four levels: small, middle, large, and recycling industry (also known as the fourth estate).

The small cycle refers to the company level: promoting environmentally-friendly design and products, fostering clean production, reducing the usage of products, services, materials, energy inputs, and pollutant emissions.

The middle cycle refers to the efforts among companies: industrial eco parks promote a symbiotic and resource-saving relationship among companies through integration of energy, materials and information.

The large cycle refers to the initiatives at the society level, focusing on the establishment of eco-cities, municipalities and provinces.

The recycling industry refers to the promotion of waste recycling at all levels of the society, encouraging the utilisation of recycled resources throughout the entire society.

Since the 1980s, the Chinese government has issued a series of laws and regulations on circular economy. These laws and regulations play an essential role in supporting the development of circular economy, since they are a legal protection. These include the Cleaner Production Promotion Law, the Energy Conservation Law, the Circular Economy Promotion Law, and so on.

The Circular Economy Promotion Law focused on development plans, supervision management systems for key enterprises with high energy and water consumptions; the requirements in this law covered production techniques, equipment, resources exploitation, recycling of waste materials, comprehensive resource utilisation, reduction, and other aspects. The role of the government was to help through special funds, technical support, tax incentives, investments, government procurement, etc (Li; Lin, 2016).

Circular economy policies mainly include: command-control tax, fiscal, financial, and pricing measures; they focus on the upgrade of industrial structures, cleaner production, recycling and comprehensive utilisation of waste materials, exploitation and utilisation of resources and energy (Li; Lin, 2016).

For circular economy to properly works, laws, regulations, and standards are essential as they protect and support the development of circular economy; comprehensive policies (plans, programmes, and opinions) play a guiding role; related systems provide a long-term mechanism to promote circular economy (Li; Lin, 2016).

2.6 THE CASE STUDY OF JIANGSU PROVINCE IN SHIFTING TOWARDS SUSTAINABLE DEVELOPMENT

Jiangsu province is one of China's most developed provinces. In November 2015 the Partnership for Action on Green Economy²⁹ (PAGE) launched China's first local green economy promotion project in Jiangsu. From that moment Jiangsu province took the lead in drawing "ecological redlines"³⁰ that covers 20 percent and more of the province territory; it also established a green development evaluation system used to assess the green performance of its prefectures. In comparison to other provinces in China, Jiangsu is relatively advanced when it comes to the integration of key elements of a green economy into development plans and policies. However, some problems have not been overcome yet, and include the overloading of environmental capacity and the reliance on heavy industry.

Although the province in 2011 adopted a series of green economy policies, the reliance on heavy industry intensified the conflict between economic development and resources and environment; the slower economic growth restricted the capacity of the green transition; environmental risks derived from rapid urbanization; regional differences in the green economy progress remained. Together with the macroeconomic challenges, Jiangsu must also face several sector-specific challenges, including the insufficient domestic energy supply, incapable to meet its demand, inefficient water use and agricultural pollution, and the difficulties of the manufacturing sector to gain more importance into the international value chain. The transition to a green economy is also challenged by the import-export structure, as exports are for the major part goods with large resource consumption and environmental pollution. (Environmental Protection Department of Jiangsu Province, 2015)

²⁹ Partnership for Action on Green Economy: PAGE is a multi-year initiative assisting 30 countries in their efforts to embark green economy pathways. It aims to contribute to the transformation of national economic structures in developing countries with the intent to achieve environmental sustainability.

³⁰ Ecological redline: in Chinese 生态红线 (shengtai hongxian); an environmental zoning line to ensure minimum space required for ecological health in environmentally vulnerable regions.

Jiangsu province is located in the Yangtze River Delta in eastern China, covering a land area of 107,200 square kilometres. Jiangsu represents one of the economically well-developed provinces in China. Jiangsu province has 13 prefectures: Nanjing, Wuxi, Xuzhou, Changzhou, Suzhou, Nantong, Lianyungang, Huai'an, Yancheng, Yangzhou, Zhenjiang, Taizhou, and Suqian. Nanjing is the provincial capital.



During the past decades, living standards and overall well-being in Jiangsu have increased drastically, due to the big progress in four key areas: sustained economic growth and industrial optimization; foreign trade and investment; rapid urbanization; urban employment in the manufacturing and construction sectors.

Despite the rapid growth, in recent years the province has grown sustainably, managing its efforts towards resource efficiency and environmental quality. Unfortunately, energy and resource consumption is still high, as the total energy consumption of Jiangsu province increased from 88.01 million tons of standard coal in 2001 to 319 million tons of standard coal in 2014 (Jiangsu Provincial Statistics Bureau, 2015). Total water consumption continues to grow, especially in domestic and industrial areas (Jiangsu Provincial Statistics Bureau, 2015). Over the years, the province has tried to manage the use of resources, with some success in pollutant emission levels which, despite the decrease, still remain at a high level.

Although the province could be considered in a state of light pollution, the overall environmental quality in Jiangsu province may be improved more; compared to the rest of China, Jiangsu is a good example of how economic development, urbanization, energy and resource efficiency and emission intensity are handled correctly, creating favourable conditions for a proper transition to a green economy (National Bureau of Statistics of China and Jiangsu Provincial Statistics Bureau, 2015) .

Even though energy and resource consumption as well as pollution emissions are relatively low, some problems, including high population density, overloading of environmental capacity, and a reliance on heavy industry, emerged. To reduce the damages caused by heavy industrial pollution and urbanization, while improving environmental quality, the Jiangsu local governments are committed to pay close attention to inclusive green economy policies. The local government has highlighted the need to consider green development as a long-term development strategy, since it may be vital for the entire province's modernization and may lead to improvements in people's well-being.

The Jiangsu province has taken the ecological civilization³¹ as a guiding strategic framework for the promotion of a green transition.

Back in 2000, Jiangsu province's authorities decided to mainstream green elements into its economic development plans; in 2004, the provincial government issued the "Planning Outline for Construction of an Ecological Province" and in 2013 the government decided to implement the "Outline for Plan on Ecological Civilization Construction", providing a blueprint for 10 years of green development across Jiangsu (Jiangsu Provincial Government, 2013).

In 2016 the province released the "Outline of the 13th Five-Year Plan for the National Economic and Social Development of Jiangsu Province", proposing a green development aimed to build a resource efficient and environmentally-friendly society (Jiangsu Provincial Government, 2016).

Among the mid and long-term plans, "Outline for Plan on Ecological Civilization Construction" (2013-2022) stresses the need to optimize ecological space, to promote a green transition, to promote constant improvements to environmental quality, and to advocate environmentally-friendly lifestyles; another plan, the "Plan for New Urbanization and Integrated Development of Urban and Rural Areas" (2014-2020) focuses on the improvements on the quality of urbanization and urban rural integration, the optimization of spatial layout, the improvement of basic public services, and the improvement of sustainable development at city level.

Since 2011 Jiangsu Provincial Government adopted a series of policies related to green economy with the intent to implement the strategies and plans. Among these we may find:

- **Energy conservation and emission reduction policies:** Jiangsu province has implemented specific effective policies to phase out high consumption and high emission facilities, and to improve industrial energy efficiency. These policies include the control over the approval of high energy consumption and high emission projects,

³¹ Ecological Civilization: in chinese 生态文明 (shengtai wenming); it represents a political vision that emphasises the ecological quality and sustainability of China's economic development. The concept was first introduced in 2007 by former President Hu Jintao and gained popularity in 2013, at the 18th National Congress.

the use of price subsidies to give to desulfurized and denitrated power plants, and the promotion of clean use of coal.

- **Clean production policies:** the provincial government issued the “Plan of Jiangsu Province for the Implementation of Cleaner Production Transformation in Key Industrial Sectors” in 2014 (Jiangsu Provincial Government, 2014), in order to implement a cleaner production system by using advanced technologies in key industrial sectors, such as iron and steel industries, cement, glass, petrochemical engineering and chemical industries. The plan had two main objectives to be achieved at the end of 2017: first, the reduction (by over 30%) of air pollutant discharge intensity of key industries; second, the establishment of a group of advanced clean production facilities.
- **Environmental industry policies:** Jiangsu provincial government issued the “Opinions on Accelerating the Development of Energy Conservation and Environmental Protection Industry” with the aim to promote the development of environmental industries. The policy includes measures such as the upgrade of environmental equipment and products in key fields, the promotion of energy management contracts (EMCs) by public institutions, and the acceleration of the environmental service sector.

To be implemented and promulgated, current policies share the same features: first, government finance is required to implement plans, measures, schemes, and policies of green transition; not only public administration is required for the implementation of such policies, but also economic means are gaining a significant role for these policies to be promulgated and implemented. Despite this, not every policy is implemented correctly, and some of them remain in the initial phase, needing cross-sectoral support since policy measures cannot be implemented until sectors involved in the transition to green economy are effectively coordinated.

Despite the achievements realised in Jiangsu province, green economy challenges remain:

The existing reliance on heavy industry plays an important role in intensifying the conflict between economic development and the environment (Jiangsu Provincial Government, 2012); the overcapacity of traditional industries increases the pressure on green economy, as it impairs the profitability of industries and weakens the expenditure effect of financial policies (Jiangsu provincial Government, 2013); the long-term dependence on secondary industry represents an impeachment on the pace of green economy growth, due to the fact that secondary industry constitutes 60-70 percent of the economic growth only within Jiangsu province. The traditional secondary industry sectors are also less powerful drivers of economic growth, but emerging industries do not represent yet potential contributors of the economy (Jiangsu Provincial Statistics Bureau, 2013).

The economic model in Jiangsu province has shifted from a high-speed growth level to one of medium-to-high speed growth. As a consequence, the development of green economy has faced some negative effects: since 2011, the declining revenues have restricted the capacity of green transition, while the fiscal revenue of Jiangsu has witnessed a constant decline since 2011 (Jiangsu Provincial Statistics Bureau, 2016); the pressure of economic growth might make local governments less active in implementing green policies.

Due to the economic downturn, several heavy industries have been shut down, resulting in job losses. In addition, heavily polluting enterprises were shut down due to the rule concerning the control of pollutant emissions.

Within Jiangsu, regional differences on green economy progresses often occur: the province is divided into three regions depending on geography, and socio-economic development: Southern Jiangsu, Central Jiangsu, and Northern Jiangsu.

Generally speaking, Southern Jiangsu is considered the well-developed economic centre, followed by Central Jiangsu; Northern Jiangsu is considered the less-developed area. The Jiangsu Provincial Environmental Protection Bureau in 2014 established a Green Development Index used to evaluate the green performances in each city within the province. The research results published in the "Report on Green Development Evaluation

of Jiangsu Province” have shown that Southern Jiangsu achieved a high level of green development, while Northern Jiangsu was ranked as the less green developed area (CAEP, 2014). In short, Northern and central Jiangsu have shown a poor efficiency on resource management and have paid environmental costs for their economic development. Their choices in the future will probably result in Jiangsu province making special efforts to improve resource efficiency and reduce the pollution intensity of Northern and Central Jiangsu.

To fight against the challenges of transitioning towards a greener economy, Jiangsu took and still takes into account few measures: for what concerns the awareness of green economy, governments, enterprises and individuals are required to make several efforts to realize green production, green consumption, and behavioural change. Incentives should be established to guide enterprises, individuals and the entire society to increase green awareness and to build a social atmosphere of green development. For adjusting the economic structure, to move towards green development, the key is to establish a fair market competition system and a resource conservation together with a proper environmental protection system. Technological innovation plays an essential role in implementing green thinking, so it is necessary to incorporate concepts such as sustainability, sustainable development, and green economy into technological innovation with the aim to raise resource efficiency and reduce waste discharge. The government’s task is to create mechanisms to facilitate the coordination, implementation, supervision, and evaluation of green economy policies, making these able to work in a consistent and coherent manner. Government management is necessary to ensure that green development policies will be implemented, since it engages enterprises and the general public in sustainable activities, while creating market mechanisms, through administrative and economic measures, to work and contribute to green transition (Jiangsu Provincial Government, 2013).

Priorities in Jiangsu province for what concerns the development of a greener economy include both macro-economic and sectoral levels. Talking about macro-economic level, local governments must prioritize their efforts in five main areas:

1. Defining long-term objectives for key areas of green economy transition, including areas such energy and resource conservation, environmental quality, social equity, and implementation mechanisms. Using economic incentives as a way to guide the market and people to play a role in green economy. Helping the general public to understand and accept the concept of green economy (Jiangsu Provincial Government, 2013)
2. Reinforcing strategic management techniques in key sectors to promote green investment and green industrial transition; the methods used to reinforce the management should be compulsory laws and regulations, the integration of renewable energy power into the grid, the reduction of the cost of renewables through tax and subsidy policies, and encouraging the use of renewables in every industrial sector, residential building and vehicle. In addition, to facilitate green industrial transition, greater attention should be given to the application of clean production in traditional manufacturing sectors, while facilitating the gradient utilization of energy, circular utilization of water resources and intensive use of land (Jiangsu Provincial Government, 2013)
3. Enhancing the development of green markets and creating green production and consumption systems. Since green building is one of the key sectors, it has a significant potential to grow, and so great efforts should be paid to focus on the proper development of this high potential sector; some measures may include the focus on energy-efficient reform for the existing buildings and the encouragement for the general public to choose energy-efficient and environmentally-friendly materials. Another key sector is green transport, so attention should be given to a more efficient use of transport resources through strengthening green transports' capacity, reducing the resource and energy consumption intensity, and encouraging the public to use green transportation systems (Jiangsu Provincial Government, 2013).

4. For a comprehensive green economy development, support from infrastructure, technological innovation and management capacity are needed; investments should be prioritized in fields such as green transportation and environmental protection infrastructure development. A great effort should also be given for strengthening green technology development, especially by providing more support to technological innovation for green industries, in order to build a solid green industrial chain. Green standards, statistics, measurements, and monitoring of green growth fields should be respected; relevant laws, regulations, and policies should as well be implemented. A strategic move would be an open dialogue and exchanges with other countries, regions, and international organizations concerning green development strategies and green technological innovation, with the aim to increase the effects of green economy development (Jiangsu Provincial Government, 2013).
5. It is imperative to establish a system of green economy indicators to improve the assessment and evaluation systems, so that governments at all levels should be able to implement green development concepts. At the same time, it is required a fiscal policy' leverage to enhance green economy development thanks to the support provided to the research, development, sales and market promotion of green and energy-efficient products. An adequate investment in green transition from both private and public sources is considered essential because the support of green finance development may be influential in providing credit support to green technology development and to the establishment a credit guarantee system for technological innovation for small and medium-sized enterprises (Jiangsu Provincial Government, 2013).

When it comes to sectoral level, priorities should be given to energy, agriculture, industry, trade and consumption sectors:

- Local government should improve energy efficiency and control energy consumption by cutting down energy consumption from industries with high energy demand and excessive capacity; at the same time, it is necessary to manage total energy consumption of all industries. The development of clean and renewable energy sources may be facilitated by upgrading and transforming outdated coal power generating units (Jiangsu Provincial Government, 2013).
- Investments in the agricultural sector should be given priority on one hand to water-saving projects; on the other hand, Value Added Tax policies for the sale of fertilizers should be implemented to reduce the widespread use of fertilizers, pesticides and other materials that damage the environment (Jiangsu Provincial Government, 2013).
- Local government should accelerate the phase-out of outdated capacities, suppress the rapid growth of industries with high energy consumption and high pollutant emissions, and control the proportion of heavy industry. They should also revise the entry criteria into high energy, high pollution and resource-oriented industries, while defining specific requirements for allocating resources and indicators for energy conservation and pollutant emissions. Moreover, local governments should raise environmental admittance conditions for all industries. Clean production in manufacturing sectors should be encouraged, and the establishment of an ecology-oriented industrial system should be promoted (Jiangsu Provincial Government, 2013).
- Governments should improve resource and environment efficiency by formulating environmental standards and establishing strict certification systems, strengthening international technological cooperation, improving technological level of exports and reducing energy consumption. Governments should also help businesses to move up the value chain of renewable energy production and explore new opportunities in south-south trade and investment, and also encourage the application of international sustainability standards (Jiangsu Provincial Government, 2013).

- Measures should be taken to encourage green consumption, green transports, green buildings and green energy. Measures should focus on the promotion of standards and certification systems for energy-saving and low-carbon products; encouraging the urban capacity of green transportation to improve the efficiency of transport resources; focusing on promoting energy-saving transformation of buildings, to facilitate the promotion of green buildings and to facilitate as well the industrialization of residential areas and the green renovation (Jiangsu Provincial Government, 2013).
- Finally, local government should exert the guiding role of green policies to ensure green development which would result beneficial for all social groups, through the promotion of investments in green infrastructure, enhancing green skills training and satisfying the labor demand of green transition, as well as increasing green public services, improving the quality of life of Chinese citizens, and promoting social equality (Jiangsu Provincial Government, 2013).

Although Jiangsu to a large extent is seen as one of the most developed provinces in China, even in the context of green development, the real situation is not as good as it may have been written about. Jiangsu province is very rich, partly because of its favourable position and partly because of the efforts made by the local government to promote the agricultural, industrial, and tertiary sectors. However, despite the great emphasis on green and sustainable development by local authorities, sustainability targets have proved to be difficult to achieve due to the reliance on old-style economic activities and energy sources. The reliance on coal, which achieved its highest peak in 2014, made very difficult for Jiangsu to switch to different energy sources, especially because coal is not only used in industrial and other economic activities, but it is also used in every household. Coal alone is not the main contributor to the lack of commitment in implementing green policies in Jiangsu; local authorities were not able enough to monitor enterprises and citizens, and failed to promote and implement further policies that could have turned Jiangsu into the very first sustainable province in China. Despite the difficulties, Jiangsu local authorities are working to improve monitoring and funding systems, create more awareness among citizens on the damages the uncontrolled economy has on the environment and on their health, build more

environmentally-friendly facilities, and improve the use of cleaner energy sources, so that in the near future Jiangsu will finally achieve the targets and become a green province.

3. CHAPTER THREE

3.1 CHINA'S GREEN ECONOMY STAKEHOLDERS

In analysing the policies implemented by the government for greening the Chinese economy and improving sustainable development, we must answer some questions: who is involved in driving the changes in policy and practices for achieving a greener economy? Where do strong interests originate? Who enables and obstructs the changes?

The government stakeholders' efforts all contribute to the leadership's efforts to drive China's green economy transition (He, 2012; Lu, 2012; Mol, 2012; Beckers, 2012). The first and primary stakeholder is the Central Government, which plays a fundamental role across every level and sector; in particular the NDRC and MEP represent the driving forces for the implementation of innovative green policies and the implantation of environmental agenda into economic planning. The MEP plays a leading role in implementing eco-cities projects, environmental industries, and green credit; NDRC is responsible for the lead on renewable energy policies and the cadre appraisal system based on environmental targets. Other ministers play also prominent roles in their fields; the Ministry of Finance, for instance, has taken the leading role in instituting green finance incentives (Xiaoxue, 2015; Zhanfeng, 2015; Dong, 2015; Ying, 2015).

Within the financial sector, some other institutions are also influential: the People's Bank of China and the three regulatory commissions: China Banking Regulatory Commission, China Securities Regulatory Commission, China Insurance Regulatory Commission, which are collectively referred to as the "One Bank and Three Commissions" (一行三会).

China Banking Regulatory Commission (in Chinese 中国银行业监督管理委员会 zhongguo yinhangye jiandu guanliweiyuanhui) (CBRC) was established on April 2003. CBRC is authorised by the State Council to supervise and regulate banks, asset management companies, trust and investment companies, and other depository financial institutions in China, while maintaining the stable and lawful operation of the Chinese banking sector.

China Securities Regulatory Commission (in Chinese 中国证券监督管理委员会 zhongguo zhengquan jian du guan li wei yuan hui) (CSRC) is the main regulator of Securities industry in China. CSRC oversees China's centralized securities supervisory system, regulates and supervises the security issuers, investigates and imposes penalties for illegal activities related to securities and futures. Its responsibilities include formulating policies, laws, and regulations that concern markets in securities and futures contracts; overseeing issuing, trading, custody, and settlement of equity shares, bonds, and investment funds; supervising listing, trading, and settlement of futures contracts, future exchanges, securities, and future firms.

China Insurance Regulatory Commission (in Chinese 中国保险监督管理委员会 zhongguo baoxian jian du guan li wei yuan hui) (CIRC) regulate Chinese insurance products and services markets and maintain legal and stable operations of insurance industry. The main functions of CIRC are: formulate policies for developing the insurance industry, approve the qualifications of insurance companies, examine and approve the qualifications of managers of insurance companies, regulate prices and insurance schemes, supervise the financial health of insurance companies, and supervise fair competition in industry.

These commissions together could achieve an even bigger impact for green development by mainstreaming the green agenda in the financial sector and providing financial incentives.

Local governments are considered instrumental players, since implementation of green policies is largely directed by provincial, city, and county official, no matter how ambitious the central government is. The influence of local governments is greater than their interest in implementing the green agenda (Xiaoxue, 2015; Zhanfeng, 2015; Qiong, 2015; Ying, 2015).

The second most important stakeholder is the public, which demands environmental progress. In particular, the urban's population has greatly influenced policymakers through its discontent with air pollution and dirty industries (Xiaoxue, 2015; Zhanfeng, 2015; Qiong, 2015; Ying, 2015). For instance, in large cities public pressure against polluting industrial plants and air pollution has already led to change³² (Li et al., 2012; Huang and Yip, 2012;

³² Particularly in cities like Xiamen and Dalian

Geall, 2013). For instance, back to 2016, President Xi Jinping affirmed that the fight against pollution was considered to be China's priority, and the governments vowed to reduce air pollution across 28 northern cities in 2017. On December 2017 China published the very first "green development" index, ranking regional governments which promoted environmentally friendly development, and Beijing was on top of the index. However, while Beijing was on top of the index, it came in 30th out of 31 regions in a separate survey, concerning public satisfaction with the environment. The explanation for this big discrepancy is that the green index was based on statistical parameters and took into account investments for cleaning up the environment and the use of resources, reflecting progress moving toward a better environment; it did not take into account public satisfaction, which was far from being positive. Beijing's policies did very little to calm anxious citizens and anger among the public kept growing due to the persistent dense smog in the capital and many other cities claimed to be environmentally friendly by the survey (Reuters, 2017).

Compared to more than ten years ago, public interest and public anxiety reached an unbearable level, causing discontent all over the country: in November 2017 in Daqing thousands of people gathered outside the city government's headquarters to protest against the high levels of pollution generated by the city's aluminium factory, and against the inability of local authorities to issue red alert when lung-invading particles exceeded a hazardous level.

Contrary to urban areas, in rural areas public pressure has led to mixed results; this is partly due to the fact that local governments often silence angry voices and do not engage in dialogue with concerned citizens, so as a result every protest remains silence and no result is achieved (Li and O'Brien, 2008; Deng and Yang, 2013).

To solve the rural environmental disputes, changes in China's broader environmental governance framework should be implemented. Changes include less emphasis on economic growth in the national development strategy, spotlight on local officials' environmental performance, and the new EPL that will pave the way for public environmental litigation. China's environmental NGOs are also considered as a civil society

stakeholder group, since they often assist the government and businesses in realising green economy objectives. For environmental NGOs, the most effective way to bring about the changes is through partnering with government departments (Schwartz, 2004).

Businesses are considered the third main group of stakeholders, due to the fact that they represent key operators of green economy policies. In the initial stage they, for the most part, passively receive instructions and directions from the government, rather than playing a more active role. When incentives are set in place, businesses drive innovation in technology and implementation in renewable energy, eco-city construction, green transports, and environmental industries (Xiaoxue, 2015; Zhanfeng, 2015; Qiong, 2015; Ying, 2015).

It is important however to make a distinction between state-owned enterprises and smaller technology-focused companies. The latter in fact are beneficiaries of the government's policies and advocates of green economy policies, particularly in renewable energy and other environmental industries. By contrast, for many state-owned enterprises, corporate social responsibility³³ efforts remain largely at the publicity level instead of affecting strategy (Loh, 2012).

As the fourth group of stakeholders, we find research institutions, which provide technical inputs and policy advice to the government, to businesses, and to civil society. In particular, government-affiliated think tanks inform the ministries. For instance, the Chinese Academy of Forestry has collaborated with international experts and researchers to devise policy options which are currently under review by the State Forestry Administration (Xiaoxue, 2015; Zhanfeng, 2015; Qiong, 2015; Ying, 2015).

³³ Corporate social responsibility (CSR): a self-regulating business model that helps a company to be socially accountable to itself, its shareholders, and the public. By practicing CSR companies are able to understand their impact on all aspects of society, including economic, social, and environmental.

Influence in shaping the green agenda

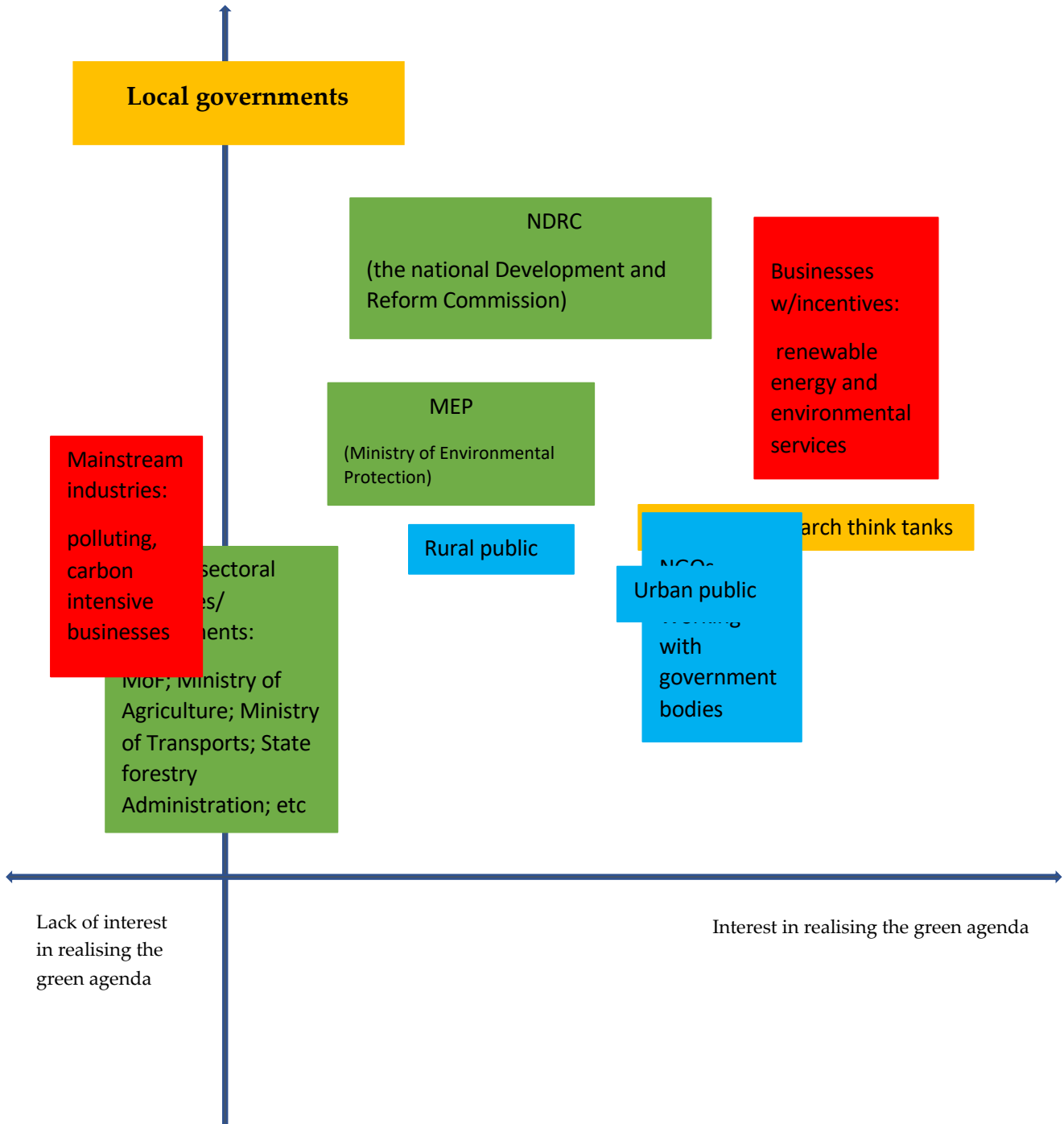


Figure 5: Green economy stakeholders’ influence and interests map

Notes: X- and Y- axes represent the stakeholders’ levels of interests and influence in realising the green economy agenda. The colour green represent central government players, orange local government and government-affiliated research bodies. Blue represent the public (urban, rural and NGOs) and red indicates businesses.

3.2 CHINA'S GREEN FINANCIAL SYSTEM

Green finance, a market-based institutional arrangement, plays an essential role in promoting environmental protection and in building an ecological society (Pan, 2015). In practice there is no single definition of green finance (Inderst et al., 2012).

Some define green finance in terms of a series of processes that guide and monitor financial flows (Pricewaterhouse, 2013); others use a range of different specified environmental objectives or sectors related to environmental challenges to describe the role of green finance (Hohne, 2012; Khosla, 2012; Fekete, 2012; Gilbert, 2012).

The transition from a resource and pollution-intensive economy to a green economy is seen as a strategic priority for Chinese leaders; key areas of such priority include clean energy, industrial energy conservation, building energy conservation, transport energy conservation, improvement of energy efficiency and environmental pollution control (Chen, 2016).

To meet the environmental challenges it faces, China must build a green financial system aimed to guide public funds toward green projects to fulfil the goal of satisfying social welfare (Ma, 2014). Despite the great emphasis the government had put in promoting green credit, very few efforts have been made for building a stable green financial system, which has remained fragmented and has not evolved from a conceptual form to a concrete one. Greening China's financial system must not be considered as an "additional" requirement, but must concern the efficiency and effectiveness of the whole system (Ma, 2014).

Nowadays, a lack of green finance might end up with serious consequences including poor allocation of capital, mispriced risks and weak long-term economic growth, and financial market instability. Serious actions must be taken by the Chinese government in order to develop a stable green financial system and avoid the negative consequences derived from a lack of green financial activities. As legal frameworks are essential in supporting the development of green finance and strengthening the enforcement of environmental law, the government should integrate green elements on regulations and laws, such as the *Law on Commercial Banks*, *Securities Law*, and the *Insurance Law*; it should also improve

environmental laws and regulations, encourage the development of local environmental laws and regulations in order to satisfy local conditions when promoting green and sustainable development, and strengthen environmental law enforcement.

The development of green finance does not only depend on the government's power, but it also includes several different subjects with specific powers and responsibilities, such as the PBoC and its three regulatory commissions, the NDRC, environmental protection authorities, financial institutions, and private standard setters and intermediaries (Daoxu, 2014). It is necessary, for these subjects to work together more efficiently, to establish a coordination mechanism between environmental, financial, and industrial regulators to ensure the stability of green finance policies and enable a mechanism of information sharing on technical information, industrial standards, and law violation. It is also necessary to create a coordination mechanism with third-party institutions such as private standard setters and intermediaries, in order to use them as a complement to legal and policy approaches. To accelerate the development of green financial system and encourage investors to adjust their investment portfolios, it is necessary to provide a system of policy support (Du; Zhang; Wang, 2013). This may include fiscal and taxation policies, monetary policies, credit policies, and industrial policies

Monetary policies are supposed to have great influence on the economy of the entire society, as they represent key elements for investment decision-making process. Among the measures to be taken we might find: the identification and elimination of sector biases in monetary policy that could result misaligned with the objectives of the green economy; the establishment of green refinancing facilities; further exploration of the relationship existing between monetary policies and green finance, including the possible consequences of environmental degradation and resource scarcity on prices and financial stability (Pricewaterhouse, 2013).

One key area holding a great potential for green finance is represented by Green Bond³⁴ market; in order to advance green bond market, some measures must be taken: a set of criteria for green bonds must be agreed, whether with a government-endorsed system or with a third-party assurance system; green loans³⁵ must be provided with a price differential compared to “brown” loans: providing a price differential for green loans in comparison with brown loans may be a useful tool in increasing green lending. Another important policy is to establish a dual resource for green municipal bonds; the main function of this policy is to give investors experience in analysing the performance of green assets, but without being exposed to any risk. When the investors are familiar with green assets’ performances, the market is able to move to green asset-backed securities³⁶. Municipal green bonds may also be used to finance a wide range of green projects; these bonds can be issued on the domestic markets, or they can be denominated in RMB in the offshore bond market in order to attract foreign investors. Among the projects municipal bonds can be used there are rail transport, renewable energy and clean water (Pricewaterhouse, 2013) (Yunwen, 2014).

The last policy measures the government could promote is related to fiscal incentives, which can be extremely beneficial to green finance, both within the real economy and through direct financial sector-facing incentives. Measures regarding incentives include: giving tax preference for green finance business lines to replace the business tax with a value-added tax in the sector; developing a new discount loan system form for green investment projects; reducing the tax on the returns on investment in green bonds to support more investments

³⁴ **Green bond:** A green bond is specifically designed to encourage sustainability and to support climate-related or other types of environmental projects. Green bonds finance projects aimed at energy efficiency, pollution prevention, sustainable agriculture, clean air, clean transportation, etc. Green bonds do come with tax incentives so they represent more attractive Investments compared to other types of bonds.

³⁵ **Green loans:** green loans are designed to assist small businesses and individuals in starting or expanding eco-friendly products or services. They are available as well for existing businesses with the intention of greening their activities and have a positive impact on the environment. Green loans promote projects such as recycling, composting, community garden, etc. the loans can also be used for home remodeling, roofing, solar panels and windows. Recently, the World Bank launched a green bonds initiative aimed to support low carbon activities.

³⁶ **Asset Backed Securities (ABS):** ABSs are financial Securities composed by a pool of assets (loans, leases, credit card debts, royalties or receivables). For investors, ASBs represent an alternative to investing in corporate debt. They allow issuers to generate more cash which is used to lend more.

on green bonds; using government's procurement to support the development of green enterprises and increase the stability of demand for green finance (Pricewaterhouse, 2013).

The operations of green finance do depend on concrete financial instrument since market players need ways to overcome market failures and manage risks and long payback periods caused by green projects (Pricewaterhouse, 2013). Concrete financial instruments green finance can provide occur in different form and include different benefits for investors investing in different activities:

Green Credit: green credit is a loan product for energy conservation and emission reduction projects. Green credit instruments replace traditional loans based on collateral with loans based on an information analysis of the future returns generated by green projects. They include financing under the Clean Development Mechanism, financing under energy management contracts, and financing for energy conservation and emission reduction technologies (Ma, 2014).

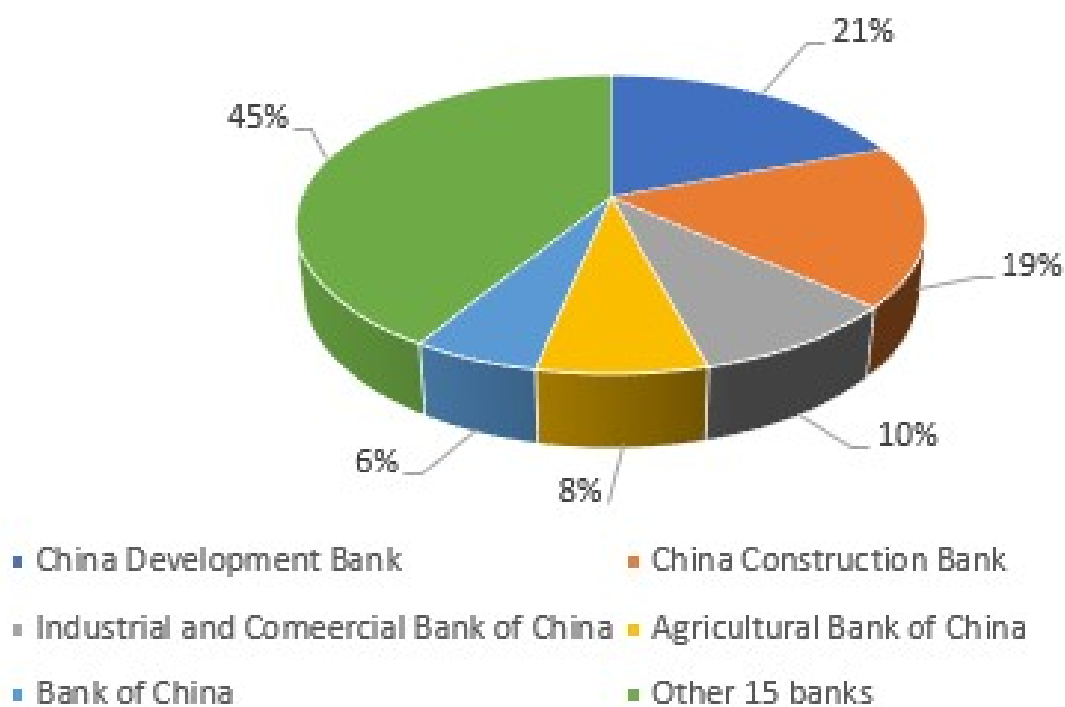


Figure 6: Issuers of green credit in China in 2015. Source: CBD, 2016; Economic Daily, 2016a; CCB, 2016; BOC, 2016; ABC, 2016; ICBC, 2016

Green insurance: green insurance, also known as Environmental Insurance, is a financial instrument which gives predominance to facilitate risk management. China's most common green insurance instrument is environmental liability insurance, which makes environmental costs of polluting companies that payed for the insurance explicit, reducing the attractiveness of investments with high environmental risks and providing incentives for risk management while assuring rapid response to pollution events. Green insurance can also provide an effective mechanism for managing the long-term risk associated with natural disasters caused by climate change (Ma, 2014).

Green bonds: green bonds are used to attract investors because a) they have shorter terms than the terms of the projects to which they provide financial support and b) for the most part they are entitled to the preferential policies of tax exemption and provide a very good return on investment (Ma, 2014).

Although the creation and the development of policies to support environmental protection, some challenges and limitations have been highlighted:

Besides social responsibility, what drives investors and lenders concerning with environmental protection is the possibility of avoiding risks (such as pollution fines), and the opportunity to make returns through efficiency savings as well as premiums for environmental services and green products. However, due to unattractive risks, long investment duration and high operation costs of green projects compared to other economic benefits to investors, the commercial banks lack the resources to promote and support environmental protection (Ma, 2015). Commercial banks also lack, for the major part, of technical expertise involved in originating green finance, which is complicated and evolves continuously. Due to the lack of experts, there is the tendency to direct investments toward understood traditional economic activities, leaving little space for investments toward green development (Ma, 2015). Green finance not only is not well financed, but it is also too dependent from the government, since the majority of users and subjects of green investments are companies guaranteed through government fiscal support.

Moreover, in China investment funds on environmental protection are largely dependant on bank loans, considered not ideal for long-term investments. The cause for a lack of alternative financing channels and financial instrument is caused by constraints imposed on financing channels, not by a preference of credit-users for bank loans (Ma, 2015).

As a way to solve the problem of insufficient environmental investments, these could be supported by special fiscal funds, which focus on national key ecological functional areas and basic environmental services. These funds should be provided on the basis of environment quality improvement or pollution control targets provided by the MoF, the MEP and other relevant local governments. At the same time, existing systems providing green investments should be improved, while listed companied should be encouraged to raise investment funds for pollution prevention and pollution control (NDRC No. 3 Announcement, 2014).

Unfortunately, bank loans and fiscal funding alone are not enough to realize green development goals; the need for investment in urban infrastructure and industrial pollution will require more diversified financial models (Ma, 2015).

As a way to support the fact that China has already made progress in its efforts toward exploring and developing market practices and policy system for green finance, it is worthy to mention some, both positive and negative, experiences and lessons. The first lesson is related to strategic political commitment, which has been a precious instrument China has been able to use to popularize the concept of sustainable development, providing a boost for the development of green financial system (Tian, 2015). Although the popularization of green development and sustainability concepts, as well as the national promulgation of environmental protection laws and regulation and the creation of targets to be achieved during the previous five-years plans, the reality China faces is much more different, since national strategies on sustainable development have not been fully implemented in the development of financial policies. That is to say, the strategies of sustainability have not been linked to concrete tactics for the development of green finance (Tian, 2015).

The second lesson focuses on the concept of reconciling different interests between central and local governments and between state and market players, which in recent years has been of critical relevance (Tian, 2015). Since green finance concerns many players with very different interests, these interests can result in policies not being fully implemented; therefore, coordination of governmental interests and market interests is essential for green finance policies to be implemented, so that the development of green financial system will be complete. China has positive examples regarding the coordination of interests. For instance, local governments are encouraged to conduct experiments on the realization of green finance activities within a broader framework set by the central government. Despite good examples, there are some negative events that demonstrate differences in Chinese parties' interests. For example, the differences between the interests of the central government and the interests of local governments. Some local governments viewed GDP growth as the main target, and so they underestimate the necessity to reach environmental protection goals (Tian, 2015). The main reason behind the difference in interests can be found in the how the performance of government official is evaluated, since officials are evaluated primarily on factors such as economic growth and inward investment, while environmental performance is often considered a formality providing a low proportion of the grade. Another important reason explaining this difference is the deviation between the intentions of the government and those of the market: instead of being an active behaviour of the market, green finance in China has been promoted solely through administrative powers (Tian, 2015). The result is that the majority of commercial banks still view the old heavy industries with high investment returns and high profit as the best prospect for loans, and do not view energy conservation and environmental protection enterprises as profitable due to their lack of guarantee. Low fines for environmental violation play a crucial role in intensifying the conflict between the government and the market, because they reduce the effective demand for green finance and reduce the motives to develop and operate green finance business³⁷.

³⁷ The situation is expected to be solved with the new Environmental Protection Law, which will increase the costs of environmental violations for enterprises.

To conclude, green finance system in China is still at an early stage of innovation and development, and it is not well balanced across channels³⁸, investors, institutions³⁹ and products.

Although China has some positive experiences in green finance markets and their development- for instance green finance policies now cover green credit, green insurance, and green securities- in practice, China's green finance situation is unbalanced, due to several causes: unbalanced financing channels, unbalanced investor structure, and unbalanced products and services. Moreover, the role of market mechanisms is not fully brought into play, due to the predominant role of the government in regulating and promoting industry, which creates severe conflicts with the market; those conflicts caused the distortion of financial markets, which is also reflected in the green financial market, where market mechanisms do not work effectively due to the governmental domination (Wang, 2015).

The results of the governmental dominance is translated into the lack of boundaries between the functions of commercial financial institutions and policy-based financial institutions, the unnecessary administrative examination and approval procedures for the stock and bond markets, insufficient information disclosure and approval procedures for the stock and bond markets, and the weakness in the regulatory framework and investor protection system. It is necessary, in order to guarantee the development of green finance system, for financial market to be free to act separately from the dominance and control of the government, which may sound really surreal due to the structure Chinese society based on the state control over financial and market institutions and the state provides the majority of funds and it is the major stakeholder for every economic activity, including the development of green finance system and the shift to green economy (Wang, 2015).

³⁸ Including banks and other deposit-taking institutions, capital markets, institutional investors etc.

³⁹ Including banks, insurance companies, and intermediary institutions.

3.3 CHINA'S GREEN JOBS

In recent years, China decided to prioritize green development in almost all of its leading economic sectors. China's green development transition may be a potential for expanding employment in economic activities and in economic sectors that may result beneficial in slowing and reducing the country's environmental impact (Pan, 2011; Ma, 2011; Zhang, 2011).

It was highlighted that three main sectors- energy, transportation, and forestry- are able to provide a sum of at least 4,5 million green jobs in 2020. If those three sectors continue their expansion and their growth, it would be obvious that the economy potential for green jobs is enormous (Ma, 2011). China begun years ago to establish a long-term green vision and the majority of experts agree in saying the country will be able to meet or surpass its green economy goals. It is necessary to understand that building a sustainable future depends on accurate approaches and processes, sustainable both in theory and in practice. To achieve sustainability goals, the Chinese government necessitates to enhance its administrative efficiency and to adopt new market approaches in order to create a supportive and stable environment to help implementing the green economy (Pan, 2011; Ma, 2011; Zhang, 2011).

On many occasions, Chinese leaders emphasized their country's commitment on developing a green economy based on improved efficiency of energy and water use, shifts to renewable energy sources, and other steps. In 2007, former president Hu Jintao stated that "implementation of the scientific concept of development must rely on comprehensive, coordinated, and sustainable development"⁴⁰. The former president also affirmed that China was seeking to transform its growth patterns and to engage in greener, more sustainable development⁴¹.

⁴⁰ *Hold High the Great Banner of Socialism with Chinese Characteristics and Strive for New Victories in Building a Moderately Prosperous Society in All Respects*. Report to the 17th National Congress of the Chinese Communist Party, 15 October 2007.

⁴¹ "Common Development and Prosperity", speech delivered at the CEO Summit of Asia-Pacific Economic Cooperation (APEC), Yokohama, Japan, 13 November 2010.

The shift of Chinese greener economy provides an opportunity to generate new pathways for economic growth, including the creation of “green jobs”⁴². Over the last decades, China put enormous efforts to boost energy efficiency in industry, transportation, and buildings; the country further developed wind, solar, and other renewable energy sources, created a resource-saving circular economy, and transformed traditional sectors using energy-efficient and environmentally sound technologies (Pan, 2011; Ma, 2011; Zhang, 2011).

Despite all the efforts the government undertook, China’s green economy potential has been partly tapped, due to the transition period during which green sectors do co-exist with old “brown” industries, including coal-based power. If green sectors gain more popularity and the country starts to endorse the further development of green economy, new job opportunities in China’s green emerging sectors will help relieve the social burden of unemployment that occurs in more traditional economic sectors (National Bureau of Statistics, 2011).

China’s green economy plans focus on three target areas: boost the share of renewable energy in the country’s energy supply, preserve and enhance national natural assets, and embrace new technologies aimed to reduce environmental impacts of traditional dirty sectors (UNEP, 2010).

China’s energy sector is heavily dependent on coal; China has vast coal reserves and relies on it for 75 percent of energy production and for 68 percent of energy consumption. Coal is known to be responsible for almost 80 percent of China’s dioxide emissions, air pollution, acid rains, and human health problems nationwide (National Energy Administration, 2011). Despite China’s increased shares of renewable energy sources in the energy mix, expected to be 15 percent by 2020, some projections do indicate that the total energy consumption will rise and coal will remain dominant (Hu, 2004). By increasing the share of renewable energy sources, the Chinese government expects to drastically reduce emissions and to green national energy supply.

⁴² Green jobs are jobs created entirely through the transformative process of green economy, which has implied a significant shift toward producing value with less environmental impact.

China's aim was to invest 5 trillion yuan (\$770 billion approximately) in new energy-related sectors between 2011 and 2020⁴³. Those energy sectors which advanced rapidly in China are solar hot water, solar photovoltaics, and wind power.

China is the world's leading country in manufacturing solar water heaters; its domestic production capacity topped 40 million square meters in 2009, positioning itself as the technology leader in this area (Rutkowski, 2009). Annual production of vacuum-tube solar heating systems do exceed 16 million square meters⁴⁴.

Solar heating systems are used widely domestically and are exported across Asia, Europe, and Africa. Projections for the growth of solar thermal sector in 2020⁴⁵ include: 237 million square meters reached in 2020 by annual production of solar water heaters; 380 billion yuan (\$58 billion) reached in 2020 by annual production of solar water heaters; 800 million square meters reached in 2020 by total installation of solar water heaters; \$1 billion reached by 2020 of annual exports of solar water heaters; by 2020 solar water heating will account for 2 percent of total renewable energy consumption and 16 percent of total energy consumption. If the projections for 2020 are achieved, 122 million tons of coal will be replaced, while there will be a reduction in CO₂ emissions of 262 million tons. Effects on employment, unfortunately, are less certain. Experts did not develop yet any reliable methodology aimed to estimate potential job creation in solar water heating sector due to the lack of comprehensive data and uncertainty about the industry's development path (Pan, 2011; Ma, 2011; Zhang, 2011).

From 2003, China's solar photovoltaic manufacturing industry has grown rapidly, thanks to the improvements in technology and added capacity for producing solar silicon materials (CCDI, 2011).

⁴³ According to the draft Development Plan for Emerging New Energy Industry, 2011

⁴⁴ Recommendations for Improving the Effectiveness of Renewable Energy Policy in China, 2009

⁴⁵ *Research Report on Development of China's Solar Thermal Industry*, 2010.

Despite the results achieved by the country, China's photovoltaic manufacturing industry may face uncertainties, and it would be difficult to predict future prospects for this emerging sector.

China's photovoltaic manufacturing industry is primarily export oriented because of the slow development of the country's solar power generation sector. Another concern is overcapacity: the rapid growth of photovoltaic manufacturing worldwide is characterized by redundant production capacity. However, as more countries promote domestic renewable, China's export-oriented photovoltaic industry would face several challenges which could affect the sector's development.

Since the 1990s, China's wind energy expanded widely. In 2010 alone, China did invest more than 300 billion yuan (\$46 billion) for developing 378 new wind energy projects (China Industrial Energy Efficiency and Clean Production Association, 2010). The country invested more than 5 trillion yuan (\$770 billion) in new energy sectors during 2011-2020, including wind power⁴⁶.

We may be able to estimate potential job creations in China's wind power market: for every megawatt of installed wind power capacity, this requires the employment of 1,5-2 full-time workers (Zhang, 2010); China's wind power development during 2006-2010 only generated around 61.000 to 81.400 full-time positions (Li et al., 2011). Estimates for 2020 say that, in addition to the previous full-time positions, 66.000 new jobs would be created, an average of 6.600 jobs annually (CREIA, 2011). The estimates do not take into account potential installation workers needed, so the actual number of green jobs in the wind power sector could be greater. In total, Chinese wind power industry, both power generation and turbine manufacturing sectors, created an average of 40.000 direct green jobs annually; further development during 2011-2020 will continue to generate around 30.000 green jobs annually.

When it comes to transportation sector, China's transportation sector is going through a transformation period. Due to the increase of average wealth of Chinese citizens, motorization sector increases as well (Chinese MEP, 2010). Transportation sector accounts

⁴⁶ Development Plan for Emerging New Energy Industry, 2011.

for more than one tenth of Chinese energy consumption, but, as vehicle volume continues to grow, Chinese energy consumption derived from transportation is expected to increase rapidly. Expectations for 2020 include 220 million vehicles more than previous years⁴⁷.

The government planned to invest on the transportation sector to make it more environmentally sustainable by 2020, by adopting low-pollution strategies aimed to rise vehicle demand and improve public transport. Chinese interest on green transportation is mainly generated by the alarming air pollution rates, which cloak many Chinese cities (Chang, 2010).

Intercity and urban rail attracted investments in China and are considered “green” approaches if we compare them with fossil fuel-intensive road and air transport. Data on employment in Chinese green transportation sector are sparse, but assuming that intercity and urban rail are green options and that these sectors employed 2.9 million people in 2009, we may agree on saying that in 2020 the employed people will be much higher than years before, since the sector has evolved and investments continued rising (Statistical Center of the Ministry of Railways, 2010; China’s Statistical Yearbook, 2010).

Private vehicle ownership in China has boomed in recent years; the Chinese market for alternatively fuelled vehicles, despite its newness, has expanded rapidly (National Bureau of Statistics, 2010). In 2009, the government initiated the “Ten Cities, One Thousand Vehicles” project aimed to promote fuel-efficient and alternative-fuel vehicles. We may say, basing our statement on China’s investment in developing and producing new energy vehicles, that if government had prioritized the development of alternative fuelled vehicles, the production of such vehicles would have led the creation of 1.2 million green jobs annually in this sector. Under a worse scenario, however, Chinese alternative fuel vehicles industry would only generate 640.000 jobs annually from 2011 to 2020⁴⁸.

⁴⁷ Data from *China Statistical Yearbook* and from the *Economic Operation Report of China Industry*, 2010.

⁴⁸ Based on forecasts in the Fuel Efficient and Alternative Fuel Vehicle Industry Plan (2011-2020), and from the Ministry of Science and Technology (MOST) and the Ministry of Industry and Information Technology (MIIT).

When it comes to the forestry sector, basing the study on an economic perspective, Chinese forestry sector does include several subsectors (including cultivation, planting, processing and manufacturing of forest products, etc) and newer subsectors have been included in recent years, and these are forest tourism, forest ecosystem management, and forest bio-industry (Pan, 2011; Ma, 2011; Zhang, 2011). From a global perspective, China does not have abundant forest resources, in fact China's forest coverage accounted for 8.6 percent in 1948, but government-led forestation efforts promoting forestation efforts resulted effective in increasing the hectares of forest in China (Ge et al., 2001). These efforts include Afforestation (the establishment of forest where there was none before) and Reforestation (the establishment of forest in areas where forest was removed in the past).

China's forestation efforts resulted in significant environmental benefits, since forestation activities absorbed more than 3.1 billion tons of carbon dioxide between 1980 and 2005, while desertification was slowed (NDRC, 2007). Forestation activities provided 10 trillion yuan in ecosystem services each year.

Forestation can also be considered as a labor - intensive activity and it can increase employment, particularly in rural areas. We can assume that, in 2010 only, forestation sector employed around 1.8 million full-time workers, but, since we know that forestation activities are short-term and seasonal work, we may be able to assume that the actual number of people employed in the sector is much higher than what we did expect (China Forestry Statistical Yearbook, 2009). Considering also that forestation activities include not only direct jobs, but also indirect jobs (such as seed nurseries and technical training) the number of people employed in China in forestry activities is very high and still growing. Managing forestation efforts is essential to preserve and maintain the green capital forests provide. Forest management activities include monitoring and preventing forest fires, preventing illegal logging and wildlife hunting, and identifying forest pests; these duties are undertaken by forest rangers. Even though forest management activities do account for a small share of China's forestry economy, it provides significant environmental benefits and is considered for this reason a crucial sector of green economy. Making an estimate based only on forest management jobs created during 2005-2010 period, more than 188.000

full-time forest management jobs were created (SFA, 2008). In reality, if all forest areas were included, the number of people employed would have been higher. Another significant sector related to forestation is forest tourism⁴⁹, that involves the establishment of forest recreation areas and the development of associated resources. China has a great potential to expand this sector, due to the 2000 or more forest parks within national borders. Only in 2008, estimates suggest that the sector employed 140.000 full-time workers, while in 2010 the sector created 178.000 direct jobs opportunities. Since forest tourism is linked with other economic activities, such as transportation, infrastructure, forest cultivation, etc, the development of this subsector will ultimately result in increasing the job-creation opportunities for these related sectors (China's Forestry Yearbook, 2011).

The macro-level sectors of green economy- transportation, energy, and forestry, are expected to create over 4,5 million job opportunities in 2020. Greening major economic sectors do indicate that the Chinese government is ready for shifting the country's economic development to a sustainable path. China set goals for every aspect of sustainable development and the country established a long-term green vision that will end up in meeting or surpassing the ambitious green economy goals previously set. Despite the emphasis on greening the overall Chinese vision, attention should also be paid on actual steps required to achieve green goals (Pan, 2011; Ma, 2011; Zhang, 2011). This means that, although green policies and green plans are important, effective implementation will surely make the difference in greening China's economy. A great lesson to be learn is that sustainable development requires approaches and processes sustainable not only in theory but also, and especially, in practice. Some key green development measures ended up being a failure or resulted in economic and environmental costs (Zhang, 2011). For instance, even though China is the leader in installed wind power capacity, one-third of Chinese capacity was not connected to the grid and resulted in investment loss for millions of dollars. Moreover, the growth in manufacturing and the lack of environmental enforcement led to serious environmental problems. In order to avoid the costs, the Chinese government must

⁴⁹ Tourism activities aimed to appreciate forest scenic resources

enhance the administrative efficiency and adopt new market-oriented approaches aimed to create a new supportive and stable environment in which green economy will flourish.

3.4 CRITICISM ON CHINA'S GREEN ECONOMY AND MEASURES TO ACCELERATE THE GREEN TRANSITION

From the early 2000s, China faced a rapid industrial expansion, associated with over investment and misallocation of resources by the central government, thus generating enormous pressure on the environment (MEP, 2013).

The Chinese government made serious efforts to assist the industrial sector, while encouraging the strengthening of environmental policy. The reinforcement of the concept of “ecological civilization” and the emphasis on innovation as the core principle within the 13th FYP are important milestones of the Chinese transition towards green development (Reuters, 2014). While some important steps towards green growth have been made by the Chinese government, several problems are far from being solved in the short-time:

- Even if energy and carbon intensities have been reduced since 1990, due to the combination of factors such as high growth rates of GDP, structural changes within national economy, and technological achievements, China continues to generate lower economic value per unit of carbon emitted and per unit of energy consumed than other countries (Göß, S.; Niggemeier, M., 2017);
- Improvements in energy intensity from the 1990s were accompanied by the development and the use of cleaner energy sources and renewable energies. Despite this, coal continues to be the dominant energy supply and power generation source (Sinton; Fridley, 2000);
- Per capita carbon emission intensity has grown in China since 2000; as GDP rates increase in the country, the amount of carbon emitted per person increase (with a lower level and a slower growth rate than production-based per capita carbon emission) (Wang, H.; Zhang, R.; Liu, M.; Bi, J., 2012);
- Despite the reduction in the total emission of some air pollutants, the levels of pollution are still high and represent a risk for the environment and for the entire society (Wang, H.; Zhang, R.; Liu, M.; Bi, J., 2012).

Due to the concerns on environmental quality and sustainable development, environmental policies became more stringent and the government took important steps to implement environmental policies and legislations, for example the 11th, 12th, and 13th FYP integrated more environmental policy objectives. Nevertheless, the type of environmental targets included in the FYPs remain limited in scope. It is widely recognised that the links between emission reduction and the environmental impacts of emission on human health and natural resources are more complex than what it seems (Wong, 2018).

The failures in meeting green policies targets are partly the result of the unrealistic nature of these targets, and partly of the inefficient implementation laws and policies approved by the Chinese government. One main mistake the Chinese government committed was not enforcing laws and regulation which could have controlled emission of pollutants during production phases, or could have promoted the use of clean energy. Along with the lack of implementation of environmental protection laws and the missed opportunities to reduce pollutants or use different clean sources of energy, Chinese producers in general do prefer to violate environmental protection laws in order to reduce the costs of production activities, making it difficult for other manufacturing companies to accept environmental regulations because of the high costs and therefore the lack of attractiveness within the Chinese markets. However, more importantly, Chinese local government officials do not cooperate in enforcing environmental protection laws and regulations, due to the fact that often local authorities take advantage from allowing pollution to take place illegally, in order to promote a higher rate of economic growth; local government officials benefit from higher levels of production output in their region, since they receive credits for economic development (Chow, 2015).

Despite the strong criticism, more positive reviews on the implementation of environmental protection regulations are available, making us able to compare these with the negative ones. Speculations about the existence of successful law implementation to protect the environment are available: One example is the strong resolve of the central government.

A second example is that central and local governments are able to enforce environmental laws and regulations since the operations of an industrial enterprise are dependent on the

approval, and sometimes the assistance, of central or local governments for the provision of land and/or credit. This means that, in order to protect and improve environmental quality, the government not only can punish possible offenders, but can also provide economic incentives for activities or people to act for the welfare of the whole society and the whole environment. A third example is represented by the fact that there is a positive income effect on the demand for a clean environment: as the development of the Chinese economy goes further in its improvements, the demand for cleaner water and air will increase, since the purchase power made Chinese citizens able to pay for it. In the long run, the favourable income will overcome the need to produce a large quantity of output, exactly how developed countries experienced in the past (Chow, 2015).

Among negative and positive reviews, it is necessary to highlight a series of technical barriers in the process of China's green development: the first barrier is represented by the rough edges in the relationship between the levels of the government; provincial and local governments are mandated by the central government to take the lead in implementing green development policies, but the lack of coordination and their preference for boosting local GDP are often an obstacle for efficiently and effectively implementing national policies. Moreover, since the country has undergone significant changes due to economic and political reforms, central power has become less strong than before, making relationships among different levels the government extremely complex. Another barrier is the lack of research and statistical capacity, since it is extremely difficult to find accurate, reliable data on economic and social trends in China. The reasons for this lack are different and depend on the lack of data collection or the problems with already existing statistical systems which require careful scrutiny to determine the reliability of the Chinese context (Pan, 2011; Ma, 2011; Zhang, 2011).

Until the government will finally find a solution for these technical barriers, there are some recommendations which can be used to facilitate the complete and more comprehensive transition to green economy in China: First, research and development (R&D) should be increased in key green technology areas, such as Chinese “clean technology”⁵⁰ industries that have a high competitive advantage due to preferential government policies and low labor costs. Despite the advantages of clean tech industries, many of Chinese industries do lack the core technologies, and so they are forced to pay high licensing fees, or import the components at high costs. These industries do need to develop their own R&D capacity, so that they will eventually be able to better position themselves in the global market (Pan, 2011; Ma, 2011; Zhang, 2011).

Second, the government should emphasize the relevance of sustainable policy implementation and build institutional mechanisms to guarantee the proper implementation of green development policies; setting green development goals alone is not enough for a successful shift to green economy. What is essential for the shift is the efficient and effective transition process, because only a more comprehensive design and policy implementation that incorporates non economic impacts is the key for finally shift to a successful model of green development. Green development policies should also depend on support mechanisms able to ensure that the policies will be implemented as sustainably as possible. But, in order to properly support the policies, supporting mechanisms need to be designed before policies are finalized and released, otherwise it will be difficult to provide a support if the mechanisms are designed and provided after the policies’ release (Pan, 2011; Ma, 2011; Zhang, 2011).

⁵⁰ Clean technology: clean technology, or clean tech, is a general term used to define and describe products, processes, and services which are aimed to reduce waste and require as few non-renewable resources as possible. Issues related to clean technology may include sourcing for the energy needed to maintain a hardware environment, including servers, workstations, and other integral parts of a business’s tech infrastructure.

Third, the role of market-incentives of China's market systems must be improved; the first market-oriented reforms were emanated in the 1980s, and since then China accomplished major steps in upgrading its domestic market system; in recent years, preferential policies were a push for China's green economy, but the quality of the transition depends on a more mature market system, and China is not mature enough yet.

For accelerating the transition, Chinese government needs to promote green development and ensure that market mechanisms will be able to help the market functioning well (Pan, 2011; Ma, 2011; Zhang, 2011).

Fourth, enact a comprehensive plan to prepare for a fast green transition; one of the main barrier in achieving a fast green transition is data availability. Although China enacted a plan for assessing the performances of provincial and local government officials in energy savings and emission reduction targets, reliable data are difficult to be available and also lack of improvement due to very few expertise and training among local statistical staff. For this reason, the Chinese government needs to invest more efforts in improving the quality of data collection and data processing (Pan, 2011; Ma, 2011; Zhang, 2011).

Fifth, the concept of green economy should be promoted at all levels of society. Since the very first beginning of Chinese green transition, the government has always been the main promoter in every significant activity and reform in China. However, further development and the quality of green economy depends also on the support and behaviour of the general public. This means that the Chinese government needs to design and to implement specific policies and education campaigns to increase social awareness of green development. In this way, more demand from citizens for green living would end up in the creation of strong incentives for fostering the shift toward a more sustainable growth (Pan, 2011; Ma, 2011; Zhang, 2011).

Lastly, the country needs to scale up its greening efforts and create synergies among these efforts by elevating green development strategies to the level of national strategies, while developing specific policy measures outlining workplans and support mechanisms for green development; at the same time the government needs to designate some institutions to carry out the strategies and a systematic plan for green policies' implementation.

A science-based green development is necessary to consolidate China's resources and to help achieving a greener economy in a way that will end up being as sustainable as possible. The process will require the evaluation of existing green development efforts, and it will provide better guidance for improving the quality of China's green transition (Pan, 2011; Ma, 2011; Zhang, 2011).

CONCLUSIONS

China's unrestrained economic development did not only made China one of the most developed and most influential countries worldwide, but it also generated unprecedented environmental challenges, causing negative ecological, socioeconomic, and health impacts that China has to cope with. Main challenges include the reduction of pollutant emissions, the development of renewable energy sources, the implementation of environmental policies, and the safeguard of public health.

Over the last four decades, the central government of the PRC has developed several strategies to reduce the threats of environmental degradation and promote a sustainable growth in China. Since the first draft Environmental Protection Law (EPL) came into force in 1979⁵¹ a plethora of efforts have been made to guarantee the achievement of environmental targets. Along with the promulgation of the EPL, one essential tool used by the central government to pursue environmental protection is socioeconomic planning. Five-Years Plans began to be adopted in 1953 and since then they have represented the most powerful tool for the government to steer national overall development. It was with the 11th FYP (2006-2010) that environmental issues became one of the main subjects of Chinese policy-making. By the early 2000s, national environmental issues had become so severe that the necessity for action was higher than ever. In 2014, the new Environmental Protection Law further provided a further confirmation of China's commitment to fight against environmental degradation and climate change. The law introduced new standards, monitoring and evaluation systems for local authorities, and regulations regarding the participation of the general public and environmental NGOs in environment-related issues. The law made possible for citizens and NGOs to take part in the debate regarding environmental issues and to sue those who failing to meet environmental targets and/or not complying with environmental standards and regulations.

⁵¹ The EPL was then formally enacted in 1989.

After both policy and infrastructural reforms, the overall quality of air and water began to get better, but there still is a long way to go in order to fully recover and reach national and international standards.

Although environmental conditions have shown some timid sign of improvement, several issues still are under intense public scrutiny. Water shortage is widespread: four major Chinese provinces-Beijing, Tianjing, Shandong, and Jiangsu-are at “extreme risk” of water shortages⁵². Also biodiversity gives cause for concern, since it continues to decline year by year. Moreover, despite the great efforts towards climate change mitigation through the reduction per capita emissions, China remains the world’s top CO₂ emitter.

The root causes for China’s failure so far in reaching environmental targets are numerous and different, but all linked together. First, the lack of coordination between the central government and local, provincial, and municipal authorities has jeopardized the possibility of creating an efficient and effective monitoring system, making it hard for the government to receive accurate data on the operations of local authorities in implementing environmental policies. The lack of coordination is partially due to the high level of corruption among every local governments’ authorities. Local protectionism and corruption have played an important role in differentiating the interests between central and local governments, curtailing the ability of green policies to improve environmental conditions. Secondly, China’s development has consistently focused on a market-based view, so environmental targets as well are considered economic benefits (they may be beneficial for attracting more foreign investors, for instance). This short-sighted approach has led the Chinese leadership to consider coal as the most attractive energy source for both industrial production and households, due to its low price and high performance, without questioning if it could have led to negative consequences neither on environment nor society. Green economy in China is not considered in view of comprehensive sustainability. In other terms, it is not seen as a balanced pursuit of environmental, economic, and social goals.

⁵² According to China Water Stress Index

To a large extent, China's approach has underestimated the importance of ecosystem services to sustain social life, and hence economy itself. In fact, if the environment is not protected this may undermine the entire socio-economic fabric.

Moreover, the Chinese government has not been able to think about the long-term effects of environmental protection policies on the overall domestic economic development. As the world's first manufacturing country, China has long insisted on large-scale production of goods, in which quantity is better than quality; this vision has led the country to concentrate on the amount of output rather than on the quality and the inner value of finished goods. This short-term vision caused the refuse of long-term investments on clean production methods or green technologies, causing the country to deal constantly with high level of pollution and high environmental degradation rates. We do not have to misunderstand, investments for green production, renewable energy sources, circular economy etc. have been made, but their effect is linked to short-term objectives, largely due to the fact that policies in China follow the old Soviet style of five-year period of time⁵³. The FYPs do include investments in environmental protection and environmentally friendly technologies and production methods, but the five years period of time is not sufficient for implementing these policies and for the equal distribution of investments across the country, Nevertheless the plans remain the most powerful tools for the country's political organization at all levels. The short-term view must be abandoned to reach concrete sustainability objectives, otherwise green economy in China will be irreconcilable with the type of development the government tried to pursue.

To conclude, my study was focused on exploring the realization of green development strategies within the Chinese context, analysing different approaches used by the central government to overcome the threats of environmental degradation, extreme pollution, and climate change. Findings show that although Chinese central government is relentlessly trying to find new and better solutions to environmental issues a very large room for improvement still remains in this respect.

⁵³ As Hilton Isabel reported in her joint work in "*China's green revolution. Energy, environment, and the 12th Five-Year Plan*"

Some may argue that China is successfully achieving environmental targets, while others do agree that China is far away from achieving green development objectives. China is on a promising path for the achievements of sustainability targets, but much more effort must be paid for the realization of sustainable and green development.

One good thing is that China is a young developed country, with a flourish economy and it does not lack the necessary resources and investments to improve R&D and new technologies aimed to overcome future threats for the environment. One thing is sure, to reach sustainability goals it is necessary for China to strengthen her resolve to pursue the path of sustainability, so that in the long-term the embracement of green development policies will bring effective benefits not only to Chinese citizens, but also to the entire world.

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