

CHINA AND EUROPE'S PARTNERSHIP FOR A MORE SUSTAINABLE WORLD

Challenges and Opportunities



Edited by
Francesca Spigarelli,
Louise Curran and Alessia Arteconi



China and Europe's Partnership for a More Sustainable World

Challenges and Opportunities

Transboundary environmental problems and European Union (EU)-China environmental trade, investment, and technical interactions are multi-dimensional, multinational, and multilevel. Delving into such themes to generate in-depth and policy relevant knowledge requires multi-country teams with broad disciplinary expertise using diverse analytical tools and methodologies. China and Europe's Partnership for a More Sustainable World is such a work. Rich and comprehensive, it sheds light on diverse topics like European investment in China's environmental sector, Chinese environmental FDI in Europe, environmental goods trade, EU and Chinese corporate social responsibility concepts, and biomass utilization and will be of immense interest to academics, businesspeople, and policymakers in China, the EU, and elsewhere.

– *Jean-Marc F. Blanchard, Executive Director,
Mr. & Mrs. S.H. Wong Center for the Study of
Multinational Corporations, Los Gatos, CA, USA*

This book offers new insights into an understudied and very important topic – EU-China relations in the environmental and energy field. The carefully researched chapters are rich in data and case studies and illuminating analysis. This book is of interest to academics, practitioners, and policymakers.

– *Genia Kostka, Professor of
Governance of Infrastructure and Energy,
Hertie School of Governance, Berlin, Germany*

A multifaceted, interdisciplinary enquiry into what actually drives bilateral investment policies and practices between the EU and China in their effort to pursue higher sustainability standards and the greening of their respective economies. This book has the rare merit of striking the right balance between theoretical and empirical research. While pragmatically recognizing the barriers to be faced, it offers direct insights into economic, legal and technological options, which can feed directly into policy formulation in both the EU and China, and adds a valuable building block to their joint aspiration for a mutually beneficial cooperation.

– *Andrea Ricci, Vice President of ISINNOVA – Institute of
Studies for the Integration of Systems; Rapporteur of the EC
Integrated Roadmap of the SET Plan and Chairman of the
EU Transport Advisory Group for Horizon 2020, Roma*

In this book you will find the interesting outcomes of a four-year EU-funded research project about the effects of EU-China cooperation in a very fast-moving field: renewable energies and environmental industries. As the research skilfully combines economic, legal and engineering approaches, the book is aimed at many readers – from academics and policy makers to general readers.

– *Augusto Ninni, University of Parma, Parma (PR), Italy*

China and Europe's Partnership for a More Sustainable World

Challenges and Opportunities

Edited by

Francesca Spigarelli

University of Macerata, Macerata, Italy

Louise Curran

Toulouse Business School, Toulouse, France

Alessia Arteconi

Università eCampus, Novedrate, Italy



United Kingdom – North America – Japan
India – Malaysia – China

Emerald Group Publishing Limited
Howard House, Wagon Lane, Bingley BD16 1WA, UK

First edition 2016

Copyright © 2016 Emerald Group Publishing Limited

Reprints and permissions service

Contact: permissions@emeraldinsight.com

No part of this book may be reproduced, stored in a retrieval system, transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without either the prior written permission of the publisher or a licence permitting restricted copying issued in the UK by The Copyright Licensing Agency and in the USA by The Copyright Clearance Center. Any opinions expressed in the chapters are those of the authors. Whilst Emerald makes every effort to ensure the quality and accuracy of its content, Emerald makes no representation implied or otherwise, as to the chapters' suitability and application and disclaims any warranties, express or implied, to their use.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

ISBN: 978-1-78635-332-0 (Print)

ISBN: 978-1-78635-331-3 (Online)

The research leading to this book was funded by the IRSES People Marie Curie Action of the Seventh Framework Programme, European Union FP7/2007-2013/ under REA Grant agreement no. 318908, POREEN. This publication does not necessarily reflect the opinion of the EU.



ISOQAR certified
Management System,
awarded to Emerald
for adherence to
Environmental
standard
ISO 14001:2004.

Certificate Number 1985
ISO 14001



INVESTOR IN PEOPLE

List of Contributors

<i>Alessia Arteconi</i>	Università Telematica e-Campus, Novedrate, Italy
<i>Loretta Battaglia</i>	University of Macerata, Macerata, Italy
<i>Caterina Brandoni</i>	University of Ulster, Newtownabbey, UK
<i>Hongbo Cai</i>	Beijing Normal University, Beijing, China
<i>Elena Cedrola</i>	University of Macerata, Macerata, Italy
<i>Louise Curran</i>	Toulouse Business School, Université de Toulouse, Toulouse, France
<i>Eleonora Cutrini</i>	University of Macerata, Macerata, Italy
<i>Mi Dai</i>	Beijing Normal University, Beijing, China
<i>Jun Gao</i>	Tongji University, Shanghai, China
<i>Yulei Gao</i>	Tongji University, Shanghai, China
<i>Neil Hewitt</i>	University of Ulster, Newtownabbey, UK
<i>Mingjun Huang</i>	University of Ulster, Newtownabbey, UK
<i>Ye Huang</i>	University of Ulster, Newtownabbey, UK
<i>Christoph Lattemann</i>	Jacobs University Bremen, Bremen, Germany
<i>Yong Li</i>	Shanghai Jiao Tong University, Shanghai, China
<i>Fabio Lorusso</i>	Istituto Universitario di Studi Europei (IUSE), Torino, Italy
<i>Federica Monti</i>	University of Macerata, Macerata, Italy
<i>Lee Keng Ng</i>	Curtin University, Sarawak, Malaysia
<i>Giuseppe A. Policaro</i>	University of Piemonte Orientale, Novara, Italy
<i>Fabio Polonara</i>	Università Politecnica delle Marche, Ancona, Italy

<i>Ruxiao Qu</i>	Beijing Normal University, Beijing, China
<i>Paolo Rossi</i>	University of Piemonte Orientale, Novara, Italy
<i>Piercarlo Rossi</i>	University of Piemonte Orientale, Novara, Italy
<i>Federico Salvatelli</i>	University of Macerata, Macerata, Italy
<i>Francesca Spigarelli</i>	University of Macerata, Macerata, Italy
<i>Marco Spitoni</i>	Università Politecnica delle Marche, Ancona, Italy
<i>Ernesto Tavoletti</i>	University of Macerata, Macerata, Italy
<i>Katiuscia Vaccarini</i>	University of Macerata, Macerata, Italy; Jacobs University Bremen, Bremen, Germany
<i>Ruzhu Wang</i>	Shanghai Jiao Tong University, Shanghai, China
<i>Yanyan Wang</i>	Tongji University, Shanghai, China
<i>Lei Wen</i>	Beijing Normal University, Beijing, China
<i>Haitao Yin</i>	Shanghai JiaoTong University, Shanghai, China
<i>Yanping Zeng</i>	Beijing Normal University, Beijing, China
<i>Mingling Zhai</i>	Tongji University, Shanghai, China
<i>Changmian Zhang</i>	East China University of Political Science and Law, Shanghai, China
<i>Lihong Zhang</i>	East China University of Political Science and Law, Shanghai, China
<i>Qun Zhang</i>	Beijing Normal University, Beijing, China
<i>Xu Zhang</i>	Tongji University, Shanghai, China
<i>Xuemei Zhang</i>	Shanghai JiaoTong University, Shanghai, China
<i>Chunming Zhao</i>	Beijing Normal University, Beijing, China
<i>Haoliang Zhao</i>	Tongji University, Shanghai, China
<i>Hui Zhou</i>	Shanghai JiaoTong University, Shanghai, China
<i>Xiang Zhou</i>	Tongji University, Shanghai, China

Foreword

In economic terms, the shift to Asia has been a fact since the beginning of this century. It is difficult to make generalizations for a continent of more than 4 billion people but Asian consumers are growing richer, with average earnings in many countries tripling over the past 10 years. China's economy represented around 5% of world GDP in 2000 and it may account for 25% by 2050.

In terms of economic development, history is accelerating: it took 155 years for Britain to double its GDP per capita, 50 years for the United States, and just 15 years for China. Over the last 10 years, Asia has accounted for half of the world's GDP growth. Forecasts indicate that Asian growth will continue to outpace Europe and the United States.

With economic growth coupled with resource consumption, one can expect more constraints on key resources. As people become wealthier, they use more energy (e.g., for mobility, air conditioning, heating, and computing), more water, eat and waste more food. Efficiency gains are often largely offset by the "rebound effect," whereby technological improvements ultimately lead to greater and not less consumption. This has been true for the electricity and in the transport sectors.

The recent progresses and new-found prosperity in China (and also in India, Brazil, and South Africa) may have knock-on effects on the demand for and availability of global resources. Global weather may become more volatile and severe (cf. hurricanes, disastrous flooding, extreme heat, and shortage of water) while rising sea levels could devastate low-lying cities like Shanghai and Hong Kong.

From a multilateral perspective, systemic governance of climate change has been agreed by 195 countries at the Conference of the Parties of the United Nations Framework Convention on Climate Change (COP-21) in Paris in December 2015. The conclusions of the COP-21 envisage a reduction of global greenhouse

gas emissions to a level that limits the global average temperature increase to below 2°C or 1.5°C above preindustrial levels.

From a bilateral perspective, this book entitled “Going Green: China-Europe Partnership’s for a More Sustainable Word” – published in the frame of the POREEN Marie Curie Action (*Partnering opportunities between Europe and China in the renewable energies and environmental industries*) brilliantly coordinated by Francesca Spigarelli – is emblematic of what two strong blocks can do together by combining their investments, cross-fertilizing their knowledge, and cocreating their futures.

The share of foreign direct investment, of megawatt of renewables installed, and the number of energy-efficient buildings are illustrative of the major changes taking place in Europe and China. The chapters of this book provide original analyses, recent key facts, and figures that pave the way toward more sustainability. This notion, sometimes called an oxymoron, covers the traditional economic, environmental, and social dimensions.

But in this trans-disciplinary book, sustainability also rightly addresses some sensitive legal issues like liability and corporate social responsibility. The chapters well integrate social sciences aspects (in the first two parts of the book) as well as science, technology, and engineering aspects (in the last part of the book). Addressing both theoretical and real-life practices, many lessons and opportunities can be drawn from this reading. From the European side, I will focus on five dimensions.

The European Union (EU) 2020 targets for greenhouse gas emissions reductions, for increasing the share of renewable energy, for improving energy efficiency, and for achieving 3% of GDP dedicated to research and innovation may be inspiring. The Energy Union is going in this direction.

Smart growth (fostering knowledge, innovation, education, and digital society), sustainable growth (making production more resource-efficient while boosting competitiveness), and inclusive growth (raising participation in the labor market, acquisition of skills and fight against poverty) are long-term leitmotifs that are good for people, the economy, and the planet.

The research efforts should stimulate technological but also social innovation and public sector innovation. Climate change, urbanization, and relative resource shortages may fuel a shift away from large coal power plants, petrol-engine cars, and energy-consuming buildings to decentralized renewable energy production, small electric and hybrid vehicles, as well as passive houses.

Global connectivity is changing how people live, how they work, and how they think. ICT, the Internet, and new mobile devices are and will continue to play a pervasive and transformational role. In 2000, there were around 700 million mobile devices, most of which did not connect to the Web. In 2015, there were 7.6 billion mobile devices worldwide, many of which are smart and connected to Internet. The European Digital Single Market follows common sense.

Europe needed over a century to develop the infrastructure to supply natural resources to the point of use: sewage farms, ports, electricity grids, pipelines, rail, and road networks. Making significant changes to this infrastructure will take decades. The new European “Circular Economy” paradigm means a shift toward reusing, repairing, refurbishing, and recycling existing materials and products. “Waste” can and should be turned into a resource.

These five dimensions are at the core of many EU–China collaborations like POREEN and URBACHINA (a collaborative research project on *Sustainable Urbanisation in China: Megatrends toward 2050*) that feed scientifically into the “EU–China Urbanisation Partnership.” These initiatives should be seen in conjunction with more technologically driven projects, mostly in ICT, energy, and transport fields funded under the “Smart Cities and Communities,” including with the large scale demonstrations, the so-called lighthouse projects.

In the near future, through Horizon 2020 – the European framework programme for research and innovation – further EU–China cooperation could take place on sustainable urbanization, on resource-efficient urban agriculture, and on innovating nature-based solutions in cities, especially to enhance the potential for international replication.

Green manufacturing and services, scaling-up of renewable energy, improvement of energy efficiency, sustainable agriculture, and low-carbon transport will certainly continue to shape the EU–China relationship. But resilience and trust should also underlie this relationship: Resilience for dealing with natural, technological, and human changes; trust among actors and institutions, shared conviction in the added value of the protection of collective goods like air, water, and public health.

Domenico Rossetti di Valdalbero
Principal Administrator at the European Commission,
Directorate-General for Research and Innovation

Introduction

For many years, the European Union (EU) and China have been developing a dialogue and effective cooperation initiatives on the need to address the environmental issues. They have found common ground on many key aspects and cooperation has been extensive in several fields. Diplomatic efforts have contributed to strengthen partnering opportunities between the countries.

The EU–China cooperation for environment protection has a quite long history. While the relation started as a mainly trade-oriented relationship, it has become a wide partnership, which has benefited from a sound institutional framework. The cooperation has embraced climate change issues, with strong linkages between energy security and environmental security.

There are several drivers for Europe's interest in strengthening environmental partnership with China. Europe has a comparative advantage in the field and has the opportunity to use this to gain bargaining power. China is a profitable market, both for the export of European environmental goods and for European firms seeking to invest locally. Moreover, helping China to diversify its energy mix and to improve its energy efficiency would have positive spillovers for the EU in terms of reduced global demand.

From the Chinese perspective, there are several reasons to engage with the EU, which include the latter's long experience in this sector and China's need to implement "more sustainable growth strategies." There are clear synergies between China's search for a more sustainable growth path and the EU's capacities in environmental protection and renewable energy technologies.

This book gathers some of the main findings of the EU-funded project POREEN on partnering opportunities between Europe and China in the renewable energies and environmental

industries. As a Marie Curie action, POREEN's goal was to produce research results which inform policy, while improving knowledge and research skills. Research outputs were developed leveraging academic mobility in China and Europe, particularly of young researchers. Their common objective was to seek to highlight opportunities to expand and develop this important relationship in a way that moves both regions toward a more sustainable future.

In a four-year time frame, researchers analyzed the opportunities and potential to boost cooperation between China and Europe in this important area. They used a variety of research approaches and academic perspectives, combining economic, legal, and engineering perspectives.

The economic dimensions of the project included the identification of critical issues, gaps, and potential for bilateral foreign direct investments and trade in the broad area of green industries. Legal research had a similar objective, but focused on offshore oil and gas extraction, renewable energies, corporate responsibility, and environmental legislation. The team's engineering research relates to energy efficiency and carbon dioxide reduction, particularly concerning transportation and low-carbon buildings.

The book is structured into three interrelated and connected parts.

Part I has an economic and policy orientation. The seven chapters examine different aspects of trade and foreign direct investment relations between Europe and China, in the renewable energies and/or environmental industries. Bilateral trade and FDI flows are analyzed, also in the light of Chinese and European green policy and cooperation initiatives. Authors identify obstacles, barriers, and difficulties faced by European and Chinese firms in initiating, maintaining, and consolidating both trade and investment initiatives in China and Europe, respectively. Key factors and issues to be addressed to further stimulate EU–China trade and investment flows are also considered.

Part II addresses the legal framework of EU–China cooperation. The first two chapters describe the Chinese environmental protection system, analyzing both national laws and governance measures. Then, the focus is on three specific themes: the electric sector in China, Corporate Social Responsibility in a comparative perspective, and the legal framework for civil liability for environmental damages deriving from energy misuse.

Part III is focused on engineering-related research activity. Two main research areas are developed, both related to energy efficiency and carbon dioxide reduction: mobility and the transportation sector and low-carbon buildings. The four chapters in this part highlight the state of the art of the engineering research group in key areas (mobility and the transportation sector and low-carbon buildings) that might have a huge potential impact on bilateral cooperation between Europe and China. One topic is related to the use of methane and biomethane, both in its compressed and liquid form, as an alternative fuel to reduce the environmental impact and GHG emissions in the transport sector. In general, biomass as feedstock energy source in China and its potential has been evaluated in detail. Whereas on the topic of low-carbon buildings, the use of heat pumps and district cooling/heating networks have been considered in order to increase the energy efficiency for space heating and domestic hot water production. Moreover, smart devices in buildings, studied on experimental test rigs, for thermal comfort and consumption reduction have been presented.

Together these diverse inputs seek to contribute to a more integrated, coherent and effective approach to EU-China cooperation in the sector.

Francesca Spigarelli
Louise Curran
Alessia Arteconi
Editors

1

Policies That Promote Environmental Industry in China

Haitao Yin, Francesca Spigarelli,
Xuemei Zhang and Hui Zhou

ABSTRACT

Purpose — We aim to comb the current policies that have been developed to promote the environmental industries in China and analyze them in a comparative manner.

Methodology/approach — We mainly use the method of text study to study the existing policies that Chinese central government published to promote the development of environmental industry. We built a database of policies and regulations from 1979 to 2015 by searching the official website of the Ministry of Environmental Protection of China.

Findings — We find that the existing policies focus on command and control approaches. Policies are more oriented to the stage of production instead of stages of investment and consumption. They rely more on negative incentive when stimulating supply and positive incentive when encouraging demand. Based on existing academic wisdom, we suggest that Chinese government should pay more attention to environmental economic policy and to stimulating demand for environmental products.

Originality/value — Few studies provide a systematic overview of the policy systems that have been developed to

promote environmental industry in China in a systematic manner.

Keywords: Environmental industry; policy; regulation; China; text study; research paper

Introduction

A cleaner and less energy-intensive development is a fundamental goal to be achieved for China. Public awareness, mostly in the urban population, has been rising on the need to have access to cleaner water, air, and soil, while the human costs of pollution are increasing rapidly (Lv & Spigarelli, 2016).

Sustainability of industrial growth as well as the health and safety of the population are priorities for the Government (China Greentech Initiative, 2013, p. 69). In the last years, all dimensions of energy security have been promoted, from availability of energy resources, applicability of technology, societal acceptability, to the affordability of energy resources (Yao & Chang, 2014).

The 12th five-year plan has set several measures to address environment issues in the country, which are considered as “economic restructuring” and “social equality.” The Third Plenary Session of the 18th Communist Party of China confirmed and strengthened measures to support China’s commitment and has placed environmental issues as the key reform priority.¹ Also, within the 13th five-year plan, the green growth is a priority. In the next five years, China is going to promote clean production, green and low-carbon industry systems, and green finance.

All measures set to promote energy saving, environmental cleanup, and the expansion of use of renewable energies are affecting demand and supply trends in China (China Greentech Initiative, 2013). Competitive national companies are growing in all relevant subsector of the green industry (Lv & Spigarelli, 2015). In this chapter, we focus on policies that have emerged in China to promote the development of environmental protection

¹<http://english.cntv.cn/special/18thpcsession/homepage/index.shtml>

industries. A better understanding of these policies and their potential impacts is essential for better policy coordination and future policy innovation, also in the light of international cooperation.

In the literature, researchers have made some efforts to combine this large and growing body of policies through categorizing them. Some understand these policies from the perspective of emphasized industrial aspects: energy saving, environmental protection, and resource recycling, while some classify them based on policy approaches; for instance, economic measures, technology measures, and regulatory measures (Ren, 2009) or macroeconomic policy, industrial policy, and pricing policy (Zhao & Hong, 2010). The classifications are developed mainly for a descriptive purpose, and often based on an ad hoc selection of policies. The existing literature does not provide much insight on policy effectiveness and does not attempt to reveal the linkage between policy approach and its effectiveness. Therefore, they cannot well serve the purpose of developing a better policy or a set of policies; that is, a prescriptive purpose.

Our study is a step to fill this gap. We collected all policies that China's central government has published to promote environmental protection industries from 1979 to 2015 and tried to look at these policies from different angles. Based on the academic observations that scholars have provided on the effectiveness of different types of policies, we offer suggestions for future policy development and implementation.

Chinese Environmental Policies: Looking at the EU and Moving Globally

In spite of its huge efforts in combating environmental pollution, China is still plagued with serious and increasingly challenging environmental issues. According to *the 2013 Report on the State of the Environment in China* (RSEC), China was the world's largest producer of COD and SO₂. China was also the biggest energy consumer, accounting for 22.4% of the global consumption (BP, 2014). Over-dependence on fossil fuels – 67.5% from burning coal and 17.8% from oil – made things worse. As reported by *the 2013 Global Carbon Project* (Carbon Dioxide Information Analysis Center, 2013), China has passed the EU for the first time in terms of per capita CO₂ emissions in 2013 and