



# ASIA'S

# ENERGY FUTURE

**Regional Dynamics and Global Implications**

EDITED BY KANG WU AND FERIDUN FESHARAKI WITH ASSISTANCE BY SIDNEY B. WESTLEY



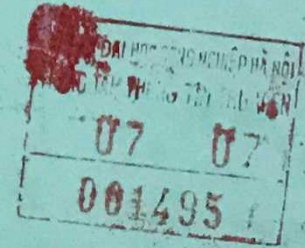
EAST-WEST CENTER



## Contents



■	<i>Preface</i>	iii
	Charles E. Morrison	
■	<i>Foreword</i>	v
	Fereidun Fesharaki	
<b>ONE</b>	<i>The Asia-Pacific Energy Dilemma</i>	1
	Kang Wu, Jeffrey G. Brown, and Toufiq A. Siddiqi	
<b>TWO</b>	<i>The Environmental Context of Energy</i>	17
	Toufiq A. Siddiqi	
<b>THREE</b>	<i>Oil</i>	35
	Widhyawan Prawiraatmadja, Kang Wu, Hassaan Vahidy, and Fereidun Fesharaki	
<b>FOUR</b>	<i>Natural Gas</i>	49
	Shahriar Fesharaki, Jeffrey G. Brown, and Tomoko Hosoe	
<b>FIVE</b>	<i>China and India</i>	63
	Kang Wu, Hassaan Vahidy, and Aarti Uplenchwar	
<b>SIX</b>	<i>Policy Priorities</i>	87
	Fereidun Fesharaki, Kang Wu, and Widhyawan Prawiraatmadja	
■	<i>Energy Insecurity Index</i>	107
	Kang Wu and Charles E. Morrison	



	<i>Acknowledgements</i>	115
	<i>Appendix: Forecasting Methodology</i>	116
	Jeffrey G. Brown and Kang Wu	
	<i>Appendix Tables</i>	118
	<i>Acronyms, Abbreviations, and Units of Measurement</i>	140
	<i>References</i>	143
	<i>Contributors</i>	147
	<i>Index</i>	148



BELOW

Three Gorges Dam on the Yangtze River in China.

When completed, this will be the largest hydroelectric power project in the world.

© Edward Burtynsky,  
courtesy Robert Koch Gallery,  
San Francisco, and Charles  
Cowles Gallery, New York

PRODUCTION OF THIS  
BOOK WAS MADE POSSIBLE  
BY THE FINANCIAL SUPPORT  
OF THE EAST-WEST CENTER

Copyright © 2007 East-West Center  
All rights reserved. Published in 2007  
Designed and produced by Barbara Pope Book Design  
Printed in Hong Kong by Everbest Printing Company

ISBN: 978-0-86638-212-0

For information or to obtain additional copies, contact:

Publication Sales Office

East-West Center

1601 East-West Road

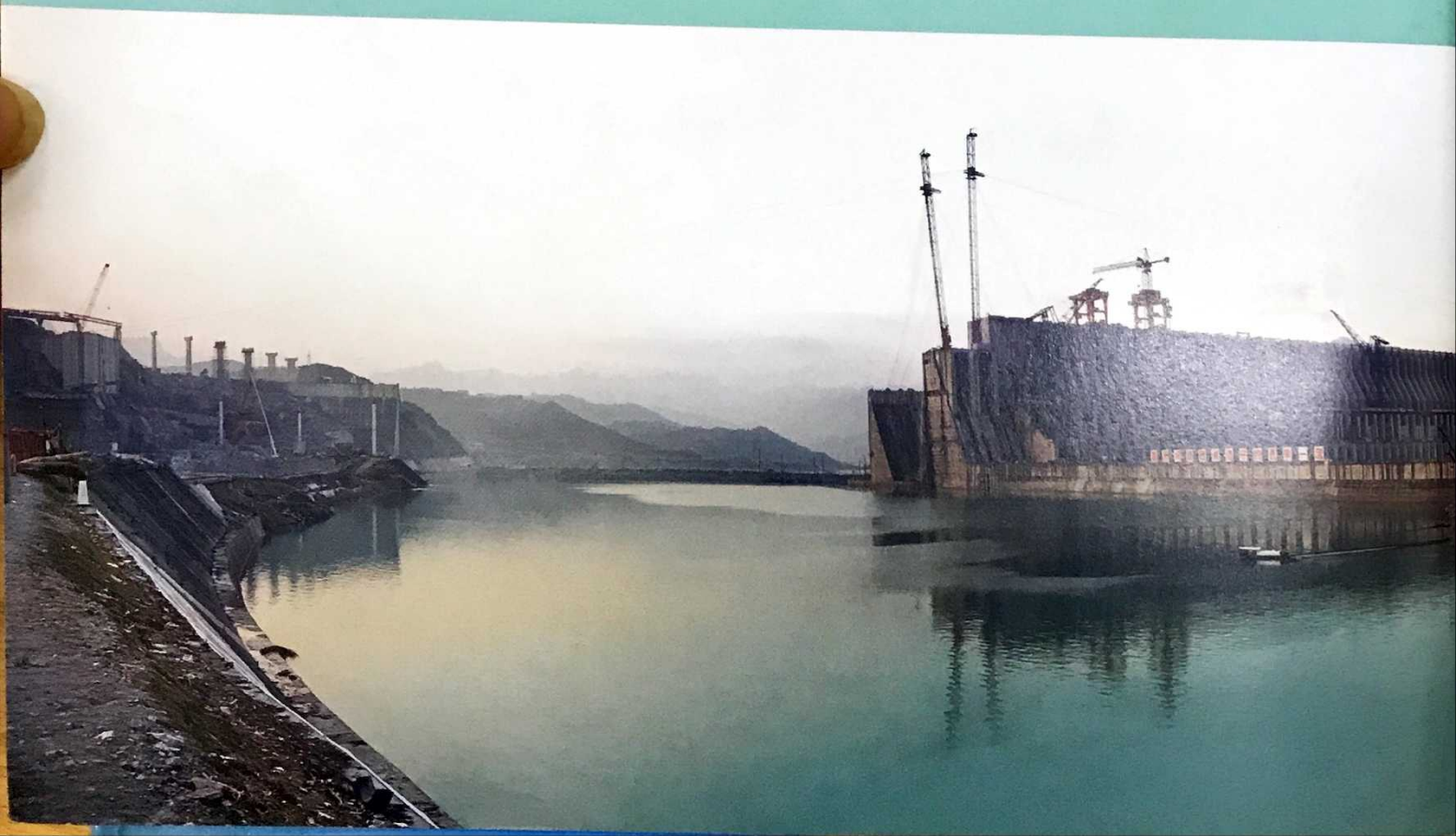
Honolulu, Hawaii 96848-1601, USA

EMAIL: [ewcbooks@eastwestcenter.org](mailto:ewcbooks@eastwestcenter.org)

TEL: (1-808) 944-7145

FAX: (1-808) 944-7376

WEBSITE: [www.eastwestcenter.org](http://www.eastwestcenter.org)



## Preface



**GIFT OF THE ASIA FOUNDATION  
NOT FOR RE-SALE**

**QUÀ TẶNG CỦA QUỸ CHÂU Á  
KHÔNG ĐƯỢC BÁN LẠI**

Energy security ranks as one of the highest-priority issues in Asia and the Pacific. The East and South Asia region is the fastest-growing oil consumer in the world, and because this region has such a small percentage of the world's oil reserves, it is the most highly dependent on oil imports of any world region. In the future, Asia will become even more dependent on imports as its energy needs expand with changing life styles and overall economic growth.

Asia's increasing energy needs have important implications for energy security throughout the world, and particularly in the United States. Like Asia, the United States is a large and growing importer of crude oil and petroleum products. It is also becoming a direct competitor with the East Asian economies for imported liquefied natural gas (LNG).

This volume is intended to provide Asians and Americans with the factual information they need for clear understanding, informed policy dialogue, and effective cooperation on issues related to energy security. The United States and Asia have much in common in terms of their basic energy situation. Both regions have enormous hydrocarbon reserves in the form of coal, but both must import huge quantities of liquid hydrocarbons in the forms of oil and natural gas. The United States has an economy and a life style highly dependent upon imported energy, and increasingly, so does Asia. The environmental implications of energy use are of growing concern in both regions. Both share a common stake in an assured supply of oil and natural gas, in price stability in international energy markets, in efficient and sustainable use of oil and gas products, and in the development of technologies and fuel alternatives that can alleviate energy security and environmental concerns.

Two editors of this volume, Fereidun Fesharaki and Kang Wu, are leading international energy experts based at the East-West Center. They have assembled an outstanding team of Asia-Pacific specialists to describe recent trends and future challenges and to lay out a set of policy recommendations designed to strengthen the region's overall energy security. We at the East-West Center hope that this book will make a strong contribution toward understanding Asia-Pacific energy issues and solving the region's common energy problems.

*Charles E. Morrison*

President, East-West Center

*Construction worker cuts steel tubing for an offshore oil-drilling platform in Batam, Indonesia. Although a member of the Organization of the Petroleum Exporting Countries (OPEC), Indonesia consumes more oil than it produces. © Robert Garvey/Corbis*

## Foreword

---

**Fereidun Fesharaki**

Concerns about energy security affect economic performance and political stability all over the world. Yet nowhere is the issue more critical than in Asia and the Pacific. In particular, rising fuel consumption to support the region's rapid economic growth has led to a worrying degree of dependence on oil imports from the Middle East.

As of 2005, Asia and the Pacific accounted for 30 percent of the world's total oil consumption but only 10 percent of global oil production (see Figure 1.10). The importance of the region is reflected not so much in its share of total consumption, however, as in its share of consumption growth. Since 1990, well over one-half of the annual growth in global oil consumption has originated from Asia and the Pacific (Table F.1). In 2004, China alone accounted for nearly one-third of the growth in oil consumption in the entire world. This rapid growth in consumption has increased imports into the region dramatically, contributing to price volatility on the global market. Coupled with emerging supply limitations, the Asia-Pacific region's increasing demand for oil raises fears of tensions among Asian nations and between Asia and the West.

Natural-gas consumption is relatively modest in Asia and the Pacific. In 2005, the region accounted for only 14 percent of the world's total consumption. The Asia-Pacific region produces more than 90 percent of the natural gas it consumes, but a trend toward rapidly increasing consumption will lead to a greater dependence on imports and will also contribute to the globalization of gas markets. Expanding trade in natural gas—both across the region and at the global level—will require enormous capital investments and elaborate networks of international agreements.

Apart from the region's role in global oil and natural-gas markets, energy consumption in Asia and the Pacific has a large and growing effect on the global environment. Coal is widely used in the region for electricity generation, domestic heating, and manufacturing. Given the level of technology currently in use, coal combustion tends to produce harmful air pollution, with effects on human health and global climate change. Several Asia-Pacific countries also use nuclear power, primarily to generate electricity. Safety and environmental issues are growing concerns.

### *The global oil market*

---

The years 2004 and 2005 brought several firsts to the global oil market. In 2004, consumption grew at the fastest rate observed over the previous 25 years. Oil