

## **Chapter 8:**

# **Energy efficiency policies of building sector in Northeast Asia: macroeconomic implications and interactions with existing climate policies**

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# 1. Background:

- ✓ Improvement in energy efficiency, by using less energy to provide the same level of economic output, is widely accepted as one of the most cost-effective means to reduce CO<sub>2</sub> emissions.
- ✓ At macro level, energy efficiency can also provide economic stimulus through investment, improving trade balances through lower energy imports, shifting the energy-capital ratio, and reducing exposure to global energy prices.
- ✓ Measures to improve energy efficiency may also generate additional employment demand as they tend to be labour-intensive.
- ✓ Importance of energy efficiency improvement as climate change countermeasures in the region.
- ✓ Therefore, we select the energy efficiency policies as the analysis targets.

## 2. Objectives:

- ✓ Overall, to estimate macroeconomic impacts of **energy efficiency** policy in East Asia using the E3ME model.

### **What is Energy Efficiency (EE)?**

Energy efficiency improvements involve technical or behavioural changes that result in lower energy consumption, while delivering the same or better energy services. Energy efficiency measures can take place on the supply-side of the energy system, in the generation, transmission and distribution of energy, and on the demand-side, where the main energy-using sectors are buildings (residential, commercial and business), transport, industry, and appliances and lighting.

### 3. E3ME Modelling of Energy Efficiency (1/2):

E3ME Inputs	Assumptions	E3ME Output
<ul style="list-style-type: none"><li>• Energy savings by users/ fuels type</li><li>• Investment</li></ul>	<ul style="list-style-type: none"><li>• How investment are funded, e.g., higher costs to industry, higher electricity price, or fiscal spending</li><li>• Time frame of policy</li></ul>	<ul style="list-style-type: none"><li>• GDP and components</li><li>• Employment</li><li>• Impacts at sector level</li></ul>

## 3.E3ME Modelling of Energy Efficiency (2/2):

Strengths	Weaknesses
<ul style="list-style-type: none"><li>• Non-equilibrium approach allows for possibility of zero or negative costs of energy efficiency options to exist</li><li>• Allows for available labour and capital to boost production level</li><li>• Full integration E3 allows for analysis of energy and climate policies in parallel</li><li>• Rebound effects of EE</li><li>• Modular approach means external source of EE savings can be incorporated</li><li>• Allows for analysis over time</li></ul>	<ul style="list-style-type: none"><li>• Not a bottom-up energy system modelling – i.e. cannot capture EE technologies (instead we can take into account of other energy-system results to provide macroeconomic impacts)</li><li>• Issues of take-up rates are not taken into account (relying on prior analysis or assumptions)</li><li>• Relationships and IO structure are based on the past (not dynamic enough to capture future technological change)</li></ul>

## 4. Analysis targets and policy scenario:

- ✓ Target countries: China, Japan and Korea
- ✓ Target sector: Building sector (residential, commercial, and business)
- ✓ Policy scenario:
  - Baseline – announced and implemented policy by mid-2012.
  - Scenario – announced (**anytime**) but not yet implemented by mid-2012.
- ✓ Information to be input:
  - Information for **individual policy or policy package**, i.e., its expected energy savings and associated investment/costs

## 5. Target counties profile (1/3): the status of energy consumption and GHG emissions

### China, Japan and Korea are:

- All rank in the top 10 countries of the total energy consumption in the world.
- Accounting for around 30% of the world's energy related CO<sub>2</sub> emissions in 2010.
- Critically important for mitigation efforts globally.

	China	Japan	Korea
Total energy consumption, Mtoe (rank)	2,471 (1)	497 (5)	250 (10)
Total GHG emissions, MtCO <sub>2</sub> (rank)	7,269 (1)	1,143 (5)	563 (7)

IEA World Energy Statistics, 2012



## 5. Target counties profile (2/3): Building sector

Buildings currently account for **40%** of primary energy consumption in most countries, and are also a significant source of carbon dioxide emissions. Among the various measures that can be pursued, the building sector offers the largest low-cost potential in all world regions by 2030 than other **SECTORS**. (Diana Ürge-Vorsatz, Climate change mitigation in the buildings sector: the findings of the 4th Assessment Report of the IPCC)

### Building sector in China, Japan and Korea:

	China	Japan	Korea
Energy consumption (% of the total)	697 Mtce (19.3%) <sup>(1)</sup>	tba	tba
GHG emissions (% of the total)		tba	tba

(1) Department of energy statistics, National statistics bureau of China, 2012

## 5. Target counties profile(3/3): EE policies of building sector

### ① China

Type of policy	Policy/measure	Policy		Programme	Target building
		Title	Start year		
Economic instruments	Subsidy/reward	Financial subsidy programme	2008	The Five-Year Plan for National Economic and Social Development of The Peoples Republic of China; and FYP specific for building sector	Existing buildings and energy-efficient products, e.g., lighting, electronic appliances
Administrative approach	Regulation	National building energy efficiency standard	2008		New buildings
		Retrofit targets for energy saving			Existing buildings (North area, others)
		Energy saving of rural buildings			Buildings in rural areas
		Energy saving operation and management			Large public buildings
Voluntary-based	Information	Government procurement of energy-efficient products	2006		Governmental office buildings
		Labeling for green building promotion	2011		Green buildings

## ② Japan

Type of policy	Policy	Start Year	Current
Regulatory Instruments	Mandatory Construction Material Standard - Top Runner Program	2013	In Force
Economic Instruments	Promotion of Zero Energy Building (ZEB) and Zero Energy Houses (ZEH)	2010	In Force
Economic Instruments	Housing Eco-Point Scheme	2010	In Force
Information and Education	Thermal Insulation Performance Labeling of Windows	2008	In Force
Policy Support, Strategic planning	Energy Conservation and CO2 Reduction Actions by Governments	2007	In Force
Information and Education	National Promotion for Energy Efficient Home Appliances	2007	In Force
Regulatory Instruments	Energy Conservation Policy for Housing	2006	In Force
Information and Education	Promoting Sustainable Lifestyle and Houses: "Lo-House" Promotion	2006	In Force
Economic Instruments	Premium Loans for Energy Efficient Retrofit/Construction for Housings	2003	In Force
Economic Instruments	Financial measures for houses (subsidy, tax, preferential loan)	2002	In Force
Economic Instruments	Promotion of Home Energy Management System (HEMS), Building Energy Management System (BEMS)	2001	In Force
Information and Education	Catalogue of High-performance Energy Efficient Appliances	2000	In Force
Information and Education	Energy Performance Description System for Houses	2000	In Force
Voluntary Approaches	Standby Power Reduction Policy	2000	In Force
Information and Education	Guidebook on Energy Conservation in Buildings	2000	In Force
Information and Education	Energy Efficiency Labelling System	2000	In Force
Information and Education	Environment and Energy Friendly Building Mark	1999	In Force
Information and Education	Free Energy Audit for Small and Medium Sized Companies	1997	In Force
Economic Instruments	Promotion of ESCO	1996	Unknown
Information and Education	Participation in International Energy Star Program	1995	In Force
Regulatory Instruments	Regulation and Standard for Housing and Building (Energy Conservation Act)	1980	In Force
Economic Instruments	Financial measures for small and meidium sized businesses (preferential loan, tax, subsidy)		In Force
Economic Instruments	Low Interest Loans for Energy Efficient Retrofit/Construction for Buildings		In Force

### ③ Korea

Type of policy	Policy/measure	Policy		Target building		Applied technology
		Title	Start year			
Regulation	Regulation	온실가스에너지목표관리제	2011	관리대상인 관리업체는 기업(법인)단위와 사업장 단위로 구분되며, 연차적으로 적용대상 확대 (기업단위: 온실가스 (tCO2)>50,000, 에너지 (TJ)>200, 사업장단위: 온실가스 (tCO2)>15,000 에너지 (TJ)>80)	기존	건물단열, 에너지 관리 장치 (조닝제어장치, 대기전력 차단 장치) BEMS(건물에너지 관리시스템), 신재생에너지(태양광, 지열, 천연열감, 고효율 난방장치)
		BEMS (서울시)	2014	연면적 10만㎡ 이상의 신축 대형 건축물		BEMS
		건축물 에너지 절약 설계 기준 (에너지 절약 계획서) (2013.2 녹색건축물 조성 지원법 시행, 2013. 9 열관류율 기준 30% 강화 및 제출 대상 확대 시행)	2003	연면적 500m2이상 신축건물		평균열관류율(단열), 기밀성 창호, 냉난방, 옥상 조경, 급탕, 조명 등
		에너지 소비 총량제 (서울시)	2013	연면적 3천m2이상 비주거, 100세대 이상 공동 주택 (신축, 리모델링포함)		난방, 냉방, 급탕, 조명, 환기
		친환경주택의 건설기준 및 성능 (그린홈 인증제도)	2009	공동주택 20세대 이상		외벽, 측벽, 창호, 현관문, 바닥, 지붕, 보일러, 집단에너지, 신·재생에너지(태양광, 태양열, 지열, 풍력), 고효율 설비(고기밀성창호, 고효율기자재, 대기전력차단장치, 일괄소등스위치, 고효율조명기기 및 공용화장실자동점멸스위치, 실별 온도조절장치, 절수기기)
Economic Instruments	subsidy	에너지 이용 합리화 법에 의한 ESCO 사업		3000m2이상 신축, 증축 건물	기존	조명, 보일러, 폐열회수, 냉난방설비
		그린 리모델링	2014	모든유형민간사업		건물단열, 에너지 관리 장치 (조닝제어장치, 대기전력 차단 장치) BEMS(건물에너지 관리시스템), 신재생에너지(태양광, 지열, 천연열감, 고효율 난방장치)
			1993	공공건축물 (LH 노후 연구임대주택, 1만m2이상)		조명교체, 냉난방, 폐열회수
Information	Information	녹색건축물인증제도 (G-SEED, Green Standard for Energy & Environment Design)	2002	공공, 공동주택, 비주거	신축	토지이용 및 교통, 에너지 및 환경오염, 재료 및 자원, 물순환 관리, 유지관리, 생태환경, 실내환경의 7개 전문분야의 평가 항목별 점수를 합산하여 등급을 인증
		건축물에너지효율등급인증제도	2013	(신기축) 주거, 냉난방 면적 500m2이상 모든용도건축물		난방, 급탕, 냉방, 조명, 환기
		신재생에너지 이용 건축물 인증제도	2011	연면적 1000m2이상인 신축 업무시설		신재생에너지
		대기전력저감프로그램 (e-Standby Program)	2008			컴퓨터, 텔레비전 등 사무·가전기기
		에너지소비효율등급표시제도				가정용 가전제품 12

## 6. On-going activities

1. Conducting a test operation of model with primarily collected data for China.
2. Further specify the major EE policies of building sector in the three countries for the setting of policy scenarios.
3. Preparing the matrix for data to be collected or assumed.
4. Collecting data for the three target countries.
5. Challenges: Policy scenario construction; Time frame for the analysis; Availability of data; Implication explanations of the calculation results; etc.

**Thank you very much for your attention and  
welcome any comment!**

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