



***Basic Metal and
Engineering Industries (BMEIs):
International Comparison of Policy
Framework and Ethiopia's Approach***
***The 4th High Level Forum on Industrial Development
in Ethiopia***



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1. Metal/Engineering industrial master plans in selected countries

Metal/Engineering industrial master plan

BMEI master plan is unique

- Hard to find “BMEI” or equivalent sector master plan in other countries
- Rather wide to be singled out as one group of sub-sectors
 - ◆ Basic Metal Industries (ISIC Rev.3.1 Div. 27): *production of metal from ore, scrap and conversion of billet, slab etc. into primary metal products*
 - ◆ Engineering Industries (ISIC Rev.3.1 Div. 28-35):
 - 28. *Manufacture of fabricated metal products, except machinery and equipment*
 - 29. *Manufacture of machinery and equipment n.e.c.*
 - 30. *Manufacture of office, accounting and computing machinery*
 - 31. *Manufacture of electrical machinery and apparatus n.e.c.*
 - 32. *Manufacture of radio, television and communication equipment and apparatus*
 - 33. *Manufacture of medical, precision and optical instruments, watches and clocks*
 - 34. *Manufacture of motor vehicles, trailers and semi-trailers*
 - 35. *Manufacture of other transport equipment*

Metal/Engineering industrial master plan (1) as a part of an industrial master plan

- **Indonesia**: National Industrial Development Policy, 2005-2025 (2005)
 - ◆ 9 out of 32 priority industries can be classified as “BMEI”: steel, machinery and equipment, transport ...

- **Malaysia**: Third Industrial Master Plan (IMP3) 2006-2020
 - ◆ 5 out of 12 target growth manufacturing industries can be classified as “BMEI”: electrical and electronics, medical devices, machinery and equipment, metals, transport equipment

Metal/Engineering industrial master plan (1) as a part of an industrial master plan

- **India**: National Strategy for Manufacturing 2006-2015
 - ◆ 2 out of 7 core sub-sectors can be classified as “BMEI” - auto components, IT hardware - and steel is one of 3 additional core sub-sectors.

- **Zambia**: Commerce, Trade and Industrial Policy (2009)
 - ◆ 1 out of 6 priority sectors can be classified as “BMEI” – engineering products

Metal/Engineering industrial master plan (2) as a sub-sector specific master plan

- **Thailand**: Master Plan for Iron Industry
 - ◆ Iron/steel industry considering linkages with downstream industries (a part of engineering industries)
- **Indonesia**: Automotive Industry Roadmap 2025 (2008)
 - ◆ Based on the automotive chapter of the National Industrial Development Policy
- **Vietnam**: Master Plan of Vietnam Motorcycle Industry for the Period of 2006-2015, with a Vision to 2020 (2007)
 - ◆ Motorcycle industry including its supporting industries

[Example] Indonesia: National Industrial Development Policy – Priority Sectors

BMEI equivalent sub-sectors

		No.	Industrial Size		Future Leading Industry	
			Small, Medium and Large-Sized Industries (SI, MI LI)	SMI		
PRIORITY INDUSTRIES (2004 – 2025)	I. Core Industry Focus (2204 – 2009)	1.	Food and Beverages • Cocoa Processing & Chocolate • Fruit Processing • Coconut Processing	• Tobacco Processing • Coffee Processing • Sugar Processing	A. Agro Industry ✓	
		2.	Marine Product Processing			✓
		3.	Textiles and Textile Products			
		4.	Footwear			
		5.	Palm Processing			✓
		6.	Wood Products (Including rattan and Bamboo)			✓
		7.	Rubber			✓
		8.	Pulp & Paper			
		9.	Petrochemicals			
	II. Related and Supporting Industry Focus	10.	Electric Machinery and Equipment			B. Transport Industry • Automotives • Shipbuilding • Aviation • Railway
		11.	Steel	17.	Essential Oil	
		12.	Plant, Construction and Mining Machineries and Equipment	18.	Handicraft and Art Objects	
		13.	Agricultural Equipment/Machinery	19.	Precious Metal and Jewelry	
		14.	Cement	20.	Earthenware/Decorative Ceramics	
		15.	Consumer Electronics			
		16.	Ceramics			
				C. Information and communication technology Industry		

(Source) www.depperin.go.id/ENG2006/default.aspx, Ministry of Industry, Indonesia

[Example] **Indonesia**: National Industrial Development Policy – Priority Sectors

■ BMEI-related priority sub-sectors

- ◆ Electric machinery and equipment
- ◆ Steel
- ◆ Plant, construction and mining machineries and equipment
- ◆ Agricultural equipment and machinery
- ◆ Consumer electronics
- ◆ Transport industry: automotives
- ◆ Transport industry: shipbuilding
- ◆ Transport industry: aviation
- ◆ Transport industry: railway

Categoraised as
« Future Leading
Industries »



[Example] Indonesia: National Industrial Development Policy – Framework by sector

One sheet per one sub-sector

Core Industry Boiler, pressure vessel, heat exchange, mechanical tool, construction machinery, mining processing machinery	Supporting Industry Factory equipment component, steel plate, design, piping/tube, welding rod, control component	Related Industry Factory, power plant, EPC.
Mid-term targets (2004-2009) <ol style="list-style-type: none"> To improve utilization of the installed capacity to about 75%; To develop domestic research and development activities in the field of factory equipment; To increase the role of national EPC contractors from subcontractors to main contractors; To increase investment in mechanical tools and mining machineries; 		Long-term target (2010-2025) <ol style="list-style-type: none"> To have the capacity to manufacture various types of locally designed and engineered equipment, mechanical tools, and mining processing equipment; To have established export capacity;
Strategy		
Sector : Efficient use of development in the sector of natural gas, energy, mining, and infrastructure as the basis for the development of domestic factory equipment industry.		
Technology : Increase in the capacity in the field of industrial design and engineering.		
Basics of Medium-Term Action Plan (2004-2009) <ol style="list-style-type: none"> To work with overseas companies in the development of industry of factory equipment and its components and mechanical tools; To make and apply SNI of factory equipment in order to secure domestic market; To encourage investment in industry of metal mechanical tools and mining equipment. 	Basics of Long-Term Action Plan (2010-1025) <ol style="list-style-type: none"> To make all types and specification of machineries needed by manufacturing and mining industry; To use cooperation with overseas sources to get access to overseas market. 	
Supporting Elements:		
Stages in Technological Improvement: (see Appendix 2 for details) <ol style="list-style-type: none"> Initiation (2004-2009): Development of new prototype, full manufacturing; Accelerated Development (2010-2015): Modification and integration of control technology; Advancement (2016-2025): Industry and Technology Upgrading. 		Human Resources: To improve the skill of human resources I the field of manufacture.
Market: <ol style="list-style-type: none"> To increase promotion to Asian and African countries for the purpose of Non-block and South-South Cooperation; To use domestic market potential. 	Infrastructure: <ol style="list-style-type: none"> To give incentive to factory equipment industry and its supporting industries in conducting research and development activities; To improve the capacity of research and development centers in the field of design and engineering of factory equipment. 	

Framework of Factory, Construction and Mining Machinery & Equipment Industry Development

(Source) www.depperin.go.id/ENG2006/default.aspx, MInistry of Industry, Indonesia

[Example] **Indonesia**: National Industrial Development Policy – Framework by sector

- Core industry: product mix
- Supporting industry: parts/components
- Related industry: beneficiary, service provider etc.
- Mid-term targets: first 5 years, target production volume
- Long-term targets: next 15 years, ditto
- Strategy: sector and technology
- Mid-term action plan: first 5 years
- Long-term action plan: next 15 years
- Supporting elements
 - ◆ Stages in technological development
 - ◆ Market: export and domestic
 - ◆ Human resources
 - ◆ Infrastructure

[Example] **Malaysia**: Third Industrial Master Plan (IMP3) (2006-20) – Framework

- [Ch.1] Performance & challenges: trends in last period
- [Ch.2] Macro-framework of the IMP3: target, priority sector, strategy, policy, implementation mechanism
- [Ch.3] External trade, [Ch.4] Investments
- [Ch.5] SME Development [Ch.6] Branding
- [Ch.7] Growth areas in the manufacturing sector: target industries
- [Ch.8-13] Non-resource based industries (6 industries): performance, prospects, challenges, strategies and policies
- [Ch.14-19] Resource based industries (6 industries): performance, prospects, challenges, strategies and policies
- [Ch.20] Growth areas in services
- [Ch.21] Development of Halal industries
- [Ch.22] Enhancing domestic capability
- [Ch.23] Human resource requirements
- [Ch.24] ICT and other technology developments
- [Ch.25] Logistics

[Example] **Malaysia**: Third Industrial Master Plan (IMP3) (2006-20) – Target industries

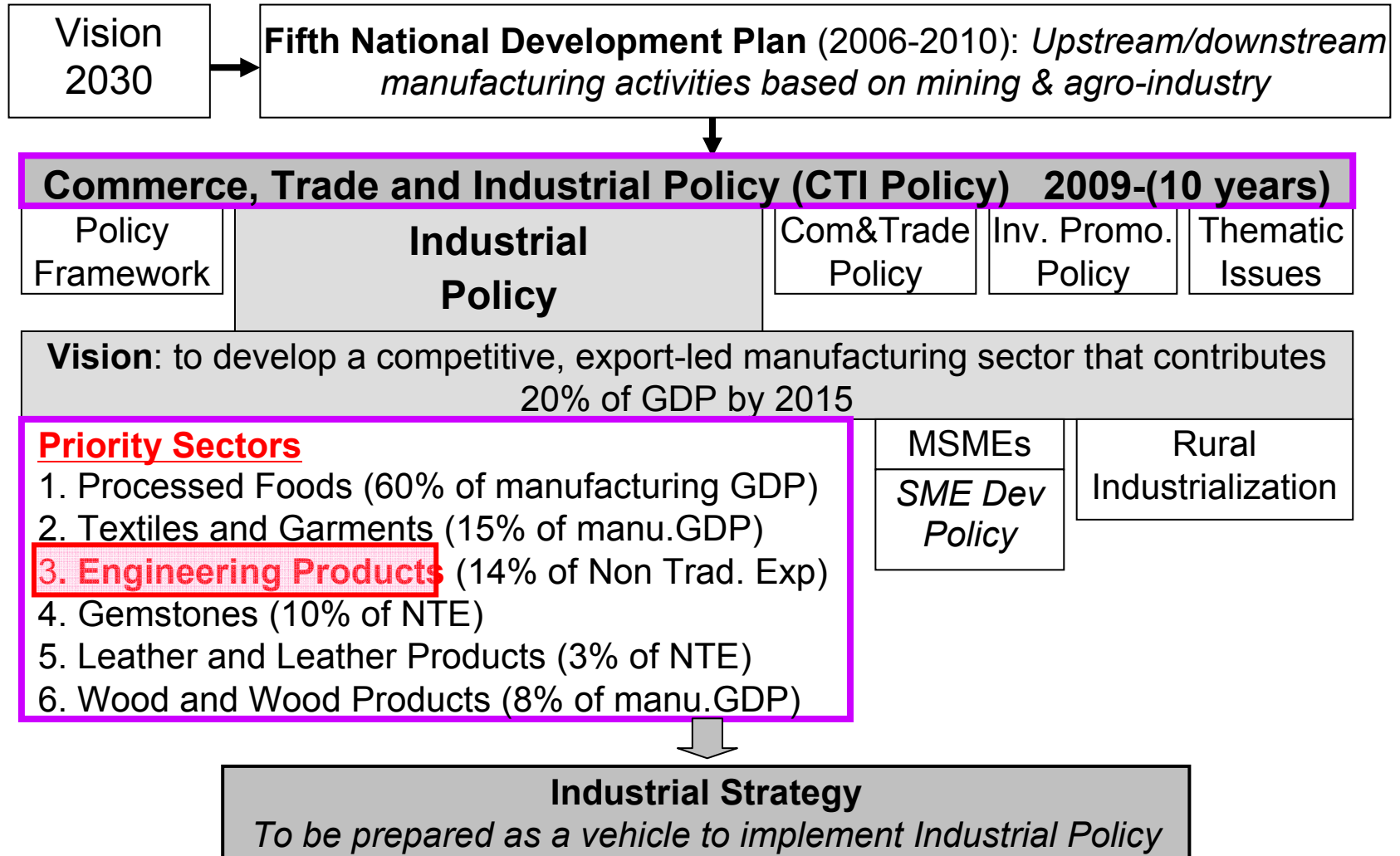
■ Non-resource based target industries (5/6)

1. Electrical and electronics: semiconductors, smartphones, PDAs, audio & visual products, PV fabricated wafers
2. Medical devices: high-end hospital & laboratory equipment etc.
3. Textiles and apparel
4. Machinery and equipment: metal working machine tools, materials handling equipment, specialised machinery, packaging machinery, fuel cell power generators
5. Metals: stainless steel plates, cold-rolled coils, wire products, welding wires, galvanised iron and sheets
6. Transport equipment: passenger cars, speciality vehicles, engines, transmissions, automotive electronics components, vessels for coastal shipping, aircraft parts and components

■ Resource based target industries (0/6)

- ◆ Petrochemicals, Pharmaceuticals, Wood-based, Rubber-based, Oil palm-based, Food Processing

[Example] **Zambia**: Commerce, Trade and Industrial Policy – Structure



(Source) Elaborated by the author, based on various documents and papers issued by the Government of Zambia, the Ministry of Commerce, Trade and Industry of Zambia and Zambia Development Agency
Japan International Cooperation Agency

[Example] Thailand: Master Plan for Iron Industry– Overall structure

- Iron/steel industry structure: Up/mid/down streams
- Downstream industry & linkages: 5 industries - electric appliances, automotive, furniture, canning, construction
- Steel industry status: capacity utilisation, import/export, cost structure, government protection, competitiveness
- Steel industry vision: 1) productivity/efficiency, 2) clustering/linkage, 3) Gov. & industry common goals, 4) domestic demand increase
- Steel industry strategic plan: SWOT, Porter Five, BCG
- 10 yrs Master Plan: 1st period (3 yrs) - 4 objectives; 2nd period (7 yrs) - 7 objectives
- Action Plan : Under 10 each problem area, 1-3 strategic plans and 2-30 action plans are listed

Master plan format

■ Duration

- ◆ Rather long period (10-20 years) of long-term master plan
- ◆ Often together with medium-term master plan (ex. 5 years) or action plan
- ◆ Rolling plan approach (ex. Malaysia: 15-years rolling plan)
- ◆ Combination of the 20 years long-term master plan (as a vision; rolling plan basis) and 5 years medium-term action plan (as a practical guidance) seem to work

■ Volume

- ◆ As a part of an industrial master plan: various – ex. Malaysia (15-35 pages for each sub-sector out of total 750 pages); Indonesia (6 formatted pages for each sub-sector out of total 250 pages)
- ◆ As a sub-sector specific master plan: various – several pages to 100 pages
- ◆ Brief and concise one would work; formatted sub-sector master plan would be useful and easy for comparison

Industry classification / prioritisation

- Most of the master plans identify priority industries (or sub-sectors)
- Some BMEI related sub-sectors are identified as priority industries and placed in a significant part in the industrial master plans
- However, not as an overarching “BMEI”
- More focused sub-sectors within the engineering industries (such as agriculture machinery, automotive, electric component...)

Performance review

- Performance during the previous plan
 - ◆ Major performances: Structural change, number of companies, new investments, productivity improvement, export/import trend, technological development, performance by major products...
 - ◆ Problems/challenges identified: Capacity utilisation, dependency on external resources (import, fund), technological/technical capability, limited policy and financial support, inadequate infrastructure...
 - ◆ Comparison with neighbouring countries, regional performances, international trends...
- Critical analysis and accurate data are required for benchmarking

Numerical target setting: metal/steel

- Numerical target setting on directly related index (ex. Indonesia) vs Less direct numerical target setting for each sub-sector (ex. Malaysia, Thailand)
 - ◆ Latter, for example, Malaysia: macro-economic targets, overall manufacturing sector targets only + Investment target by priority sector
- Crude steel industry's production capacity, iron making capacity, HRC/CRC/flat/long product capacity...
- Steel consumption per capita
- Investment volume

Numerical target setting: engineering industries

- Various according to countries and sub-sectors
- Production volume, Installed capacity utilisation
- Investment value, export value (considered as export-oriented industries)
- Supply-side capacity of component industries against demand (considered as supporting industries)
- Employment creation (considered as labour-intensive industries)

Target markets

■ Export / Domestic

- ◆ Metal/steel: Import substitution - domestic consumption oriented; some export-oriented depending on type and level of product
- ◆ Engineering: mixed

■ Client industries

- ◆ Metal/steel:
 - Downstream market creation other than construction
 - For example, Thailand - electric appliances, automotive, furniture, canning, construction
- ◆ Engineering:
 - respective industries as machinery users (prototyping and machinery development are often mentioned)
 - Assembly industries
 - Final consumers

Institutional framework

- Identification of key stakeholders
 - ◆ Ministry of Industry, Trade, Finance, Technology, Higher Education, Energy, Mineral Resources...
 - ◆ Regional Government
 - ◆ R&D and Training Institutes: Ministerial, University, Educational and Vocational, Private Institutes...
 - ◆ Business Association: by sub-sector, by elemental technology, by region, by size...
- Often duplicated/overlapped; coordination needed

Identification of appropriate technology and process

■ Metal/steel industry (*process oriented*)

- ◆ Only hot rolling / cold rolling (Long product / flat product)
- ◆ Electric arc furnace steel making – continuous casting - rolling
- ◆ Blast furnace iron making – Basic oxygen furnace steel making – continuous casting – rolling
- ◆ Direct Reduced Iron (DRI)

■ Engineering industry (*elemental technology oriented*)

- ◆ Casting (pattern making, melting, moulding)
- ◆ Forging
- ◆ Welding
- ◆ Machining
- ◆ Metal stamping and pressing
- ◆ Heat treatment and surface treatment
- ◆ Mould and die

Technology development and technical capability improvement

- Adoption of new and appropriate technology considering available resources
- Improvement of current technology quality
- Improvement of quality and productivity management
- Research and development
- Prototyping and product development
- Facility improvement and development
- Certification and standardisation system: process and skill
- Partnership and strategic alliance among industry, academy and government
- Partnership between upstream and downstream industries
- Foreign technology: partnership, investment, technology transfer

[Example] **Indonesia**: National Industrial Development Policy – Medium-term action plans for steel industry

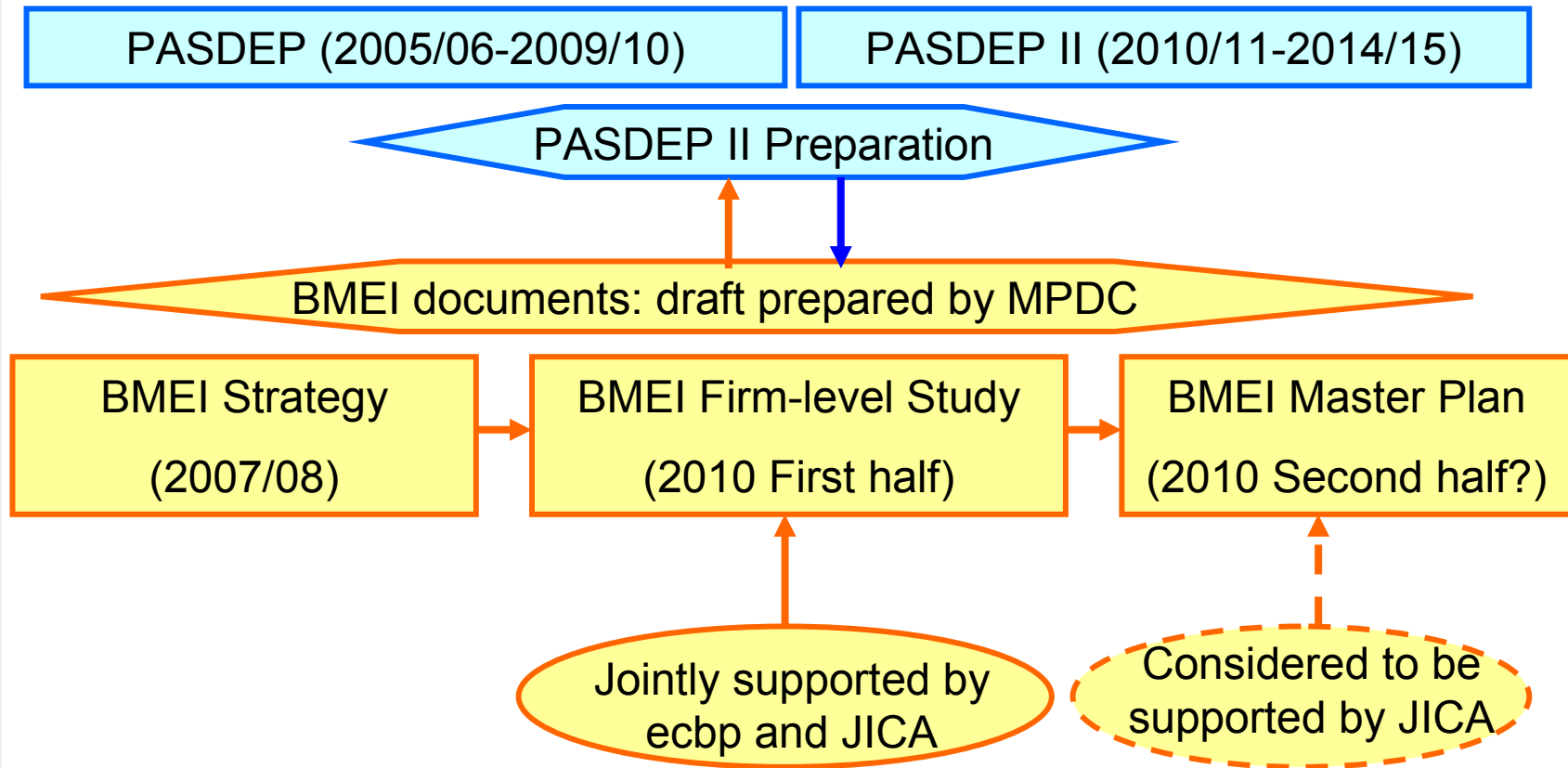
1. To facilitate partnership between upstream and downstream steel industry in order to meet the need for downstream industry raw material;
2. To facilitate restructuring of production machinery & equipment;
3. To increase utilization of nameplate capacity steel rolling industry and its downstream industries;
4. To encourage strategic between national steel industry and technology sources using local raw materials;
5. To increase monitoring over the application of SNI steel industry product;
6. To use locally-manufactured steel for construction infrastructure (natural gas mining, train rail, port, bridge, automotive, etc.) ;
7. To develop downstream industry (CRC, BJLS, natural gas piping, tinplate, big profile steel-based construction material industry);
8. To encourage the establishment of information exchange media to encourage synergy between national steel industry and its upstream and downstream industries and other related agencies; To improve partnership between upstream and downstream industry

[Example] **Malaysia**: Third Industrial Master Plan (IMP3) (2006-20) – Strategic thrust for metals industry

1. Enhancing the competitiveness of the industry to support the growth of the manufacturing and construction sectors
2. Sustaining and expanding the exports of iron and steel products for existing and new markets
3. Promoting new applications of steel in selected industries
4. Encouraging collaborations between producers and users of steel; and upstream and downstream manufacturers
5. Attracting new investments in niche areas in the sub-sector
6. Developing the skilled and qualified workforce

2. Ethiopia's BMEI policy framework and some implications for Ethiopia's BMEI

Ethiopia BMEI policy framework



BMEI Strategy

Basic Metal and Engineering Industry Development Strategy and Action Plan

As commented in last November...

- Well structured and smooth flow from general/technical background to performance review, circumstance (infrastructure, human resource, policy), gap analysis and development strategy
- Informative with some detailed data but further key industrial information and data are required to capture the whole picture of the BMEI → *need for the Firm-level Study*
- Strategic Issues, Strategic Objective and Goals and Action Plans are not always logically consistent
- “Engineering industry” seems to be broad to make effective action plans as a single industry: need to be more focused

BMEI Firm-level Study

- Period: February – June 2010
- Implementation:
 - ◆ The MPDC team headed by the MPDC Head
 - ◆ Phase 1 (field survey – collecting data): MPDC and ecbp
 - ◆ Phase 2 (analysis): The MPDC team supported by experts from ecbp and JICA and MPDC local consultants
- Field survey: 10 basic metal companies, 30 engineering companies, 10 user companies
- Expected output: A final report with current level of production capacity, available technology, human resources, machinery and equipment, raw materials and scrap, market demand and supply, gap identification, required resources and possible countermeasures etc.
- National Workshop: 1st in May for stakeholder consultation on draft final report; 2nd after completion of the final report for dissemination of the result

BMEI Master Plan

- To be prepared in the second half of 2010
- As a guidance tool for BMEI
- Based on:
 - ◆ PASDEP II Industry and Trade Chapter
 - ◆ BMEI Strategy
 - ◆ BMEI Firm-level Study
 - ◆ (Other countries' experience)
- With detailed action plans

PASDEP II Draft

BMEI Development Plan - target setting

1. Increase steel consumption per capita from 12kg (current) to 34kg (African average)
2. Full capacity utilisation
3. Develop local design/manufacturing capability
 - ◆ 90% of leather industry; 35% of textile industry; 85% of sugar industry; 85% of cement industry; 95% of construction steel; 85% of small & medium transport vehicles
4. Production value of B101 billion in 5 years

Some thoughts for PASDEP II Draft BMEI Development Plan - target setting

1. Increase steel consumption per capita from 12kg (current) to 34kg (African average)

- *This means 0.96 million tons (current) to 3.06 million tons (5 years later; assuming 2.5% pop. growth) in Ethiopia – if so, relatively good size to take off: which way to go?*
- *Target or projection? Steel consumption heavily depends on user demand, macro economy and external conditions*
- *Cf. world average is approx. 200kg (WSA)*

2. Full capacity utilisation

- *Need for data on existing capacity both metal and engineering industries through firm-level study etc.*

Some thoughts for PASDEP II Draft BMEI Development Plan - target setting

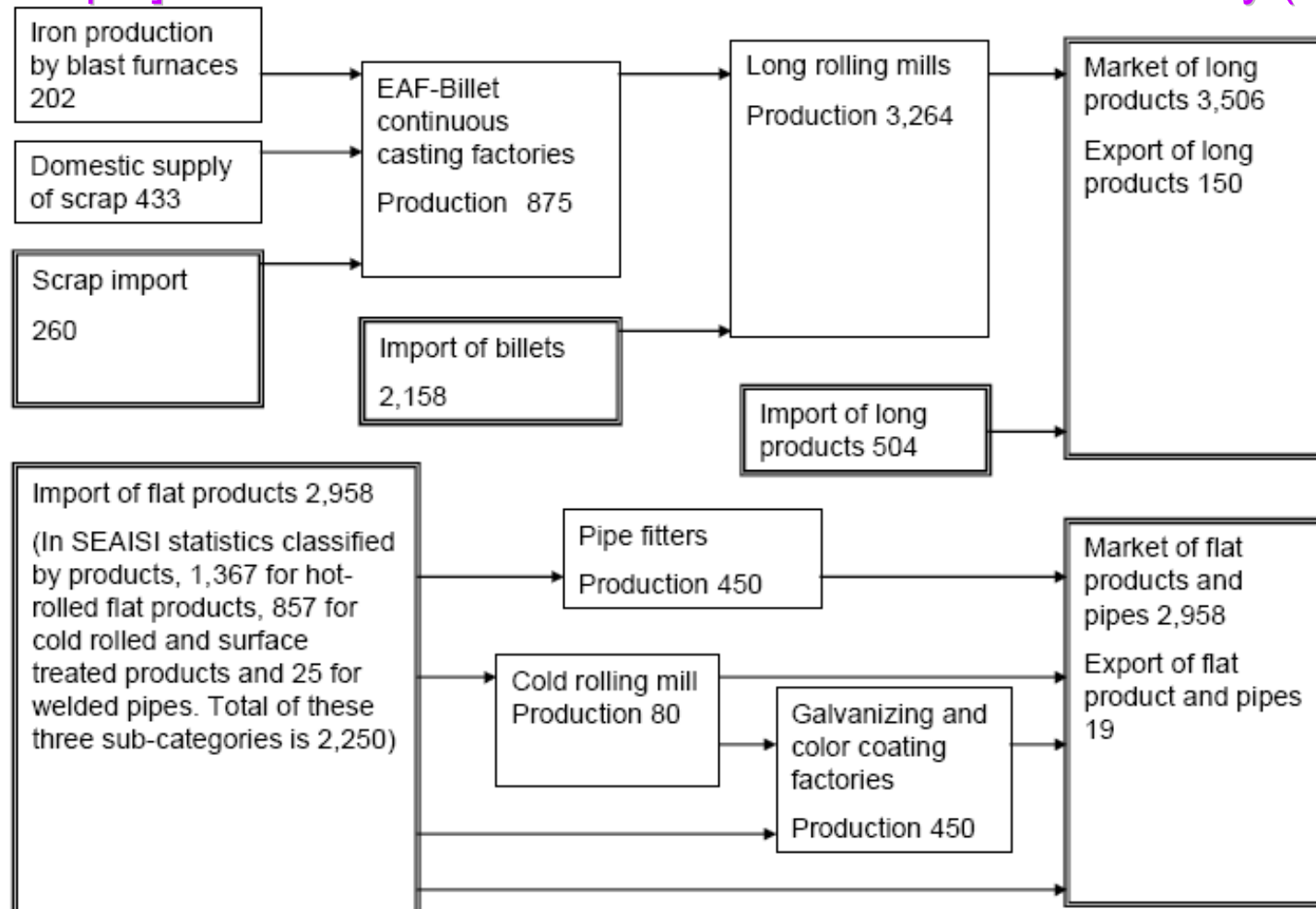
3. **Develop local design/manufacturing capability (90% of leather industry; 35% of textile industry; 85% of sugar industry; 85% of cement industry; 95% of construction steel; 85% of small & medium transport vehicles)**
 - *Seems challenging (for example, transport vehicles – compared with then local content requirement in Asian cases)*
4. **Production value of B101 billion in 5 years**
 - *meaning of production value as aggregated industries to be considered*

Other items to be considered ... see next some slides

Material flow

- Visualising and understanding material flow from iron supply to production of long and flat products

[Example] Material Flow: Vietnamese Iron and Steel Industry (2005)

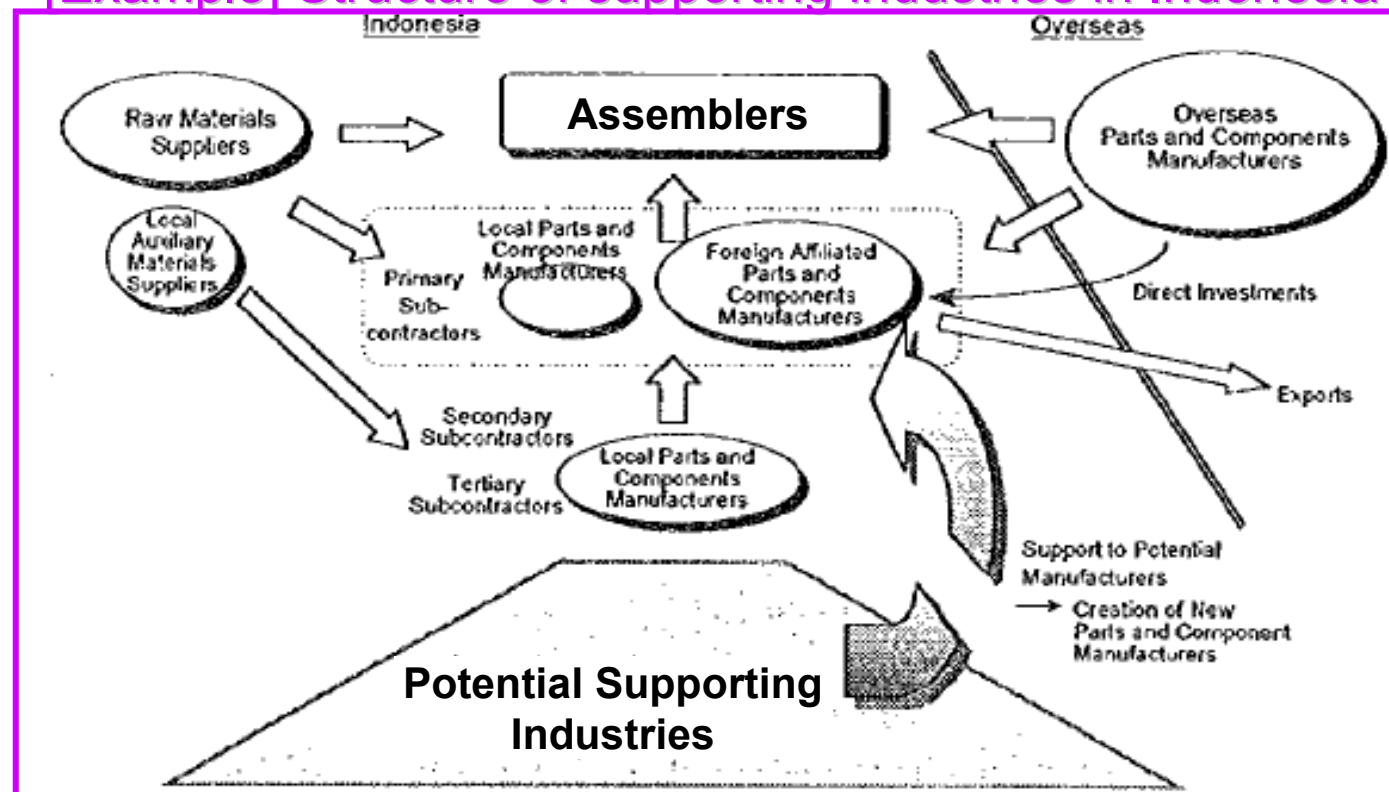


Unit 1000 tons, (Source) Kawabata (2007), compiled from SE AISI (2006) Japan International Cooperation Agency

Supporting industries

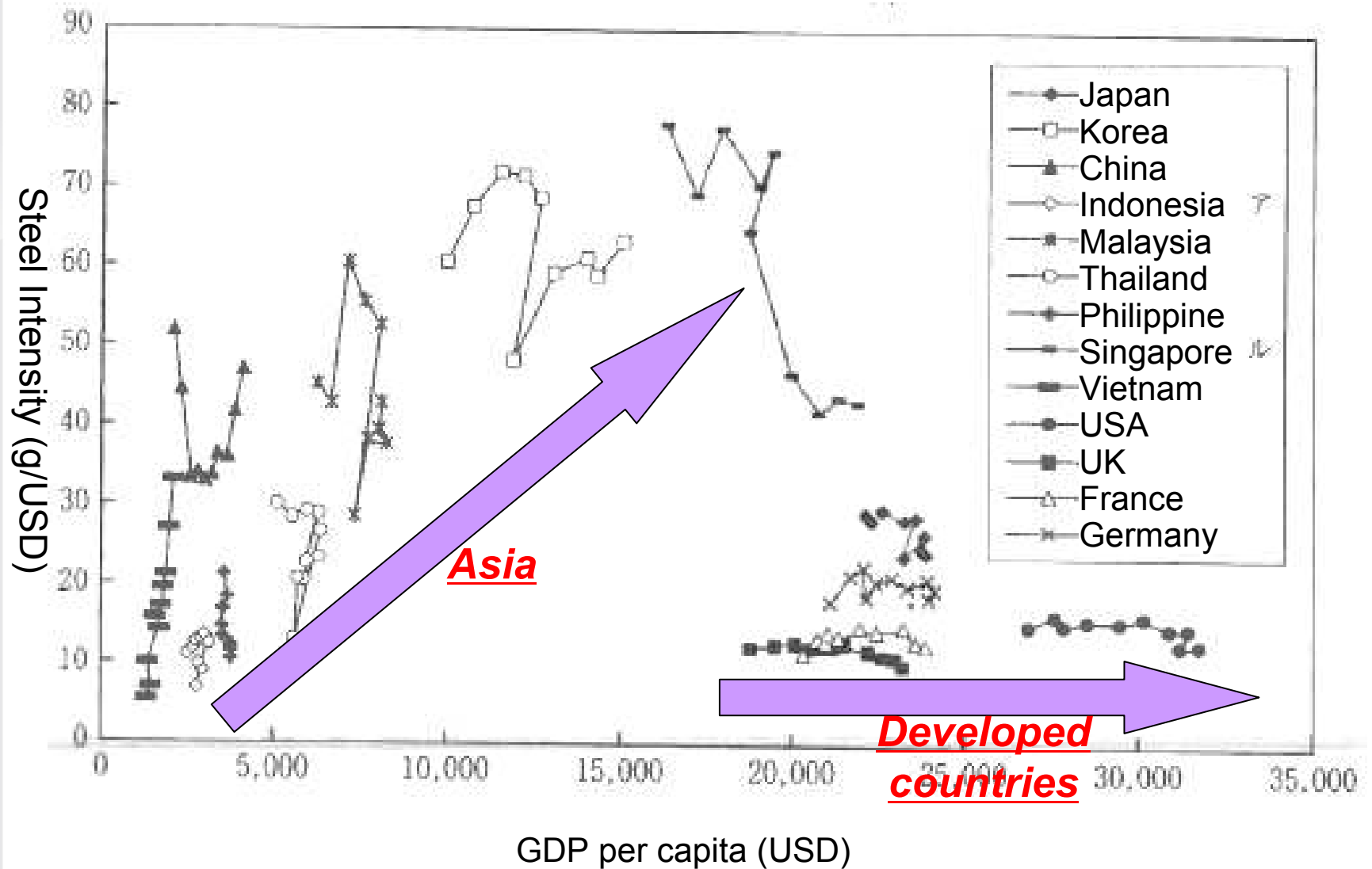
- “industries which supply various components, parts and materials for assembly makers in such mechanical industries as the automotive, electric and electronics industries” (Urata, 2000)
- Key for sound industrial structure
- Much broader meaning: supplier for i.e. agricultural machinery etc.

[Example] Structure of supporting industries in Indonesia



(Source) JICA (1997)

Steel intensity (IISI/WSA)



(Source) Kawabata (2005)

Government vs. Market

	Setting targets and specifying products, producers, investment, technology, location, markets, etc.	
	Greater scope for government	Greater scope for markets
Initial capital investment (sunk cost)	Large	Small
Gestation period	Long	Short
Market volatility	High	Low
Product type	Industrial inputs	Consumer goods
Private sector maturity and dynamism	Low	High
Government policy capability	High	Low
Trust between government and business	High	Low

(Source) Ohno, K. (2009), Industrial Master Plans: International Comparison of Contents and Structure

■ Depend on sub-sector within BMEI

- ◆ Gov. driven: Iron making, mining machinery, power plant equipment...
- ◆ Market driven: Consumer electronics, automotive, motorcycle...

Some implications

- Asian master plans are useful as references but all the master plans are unique and there is no standard
- Metal and engineering industries are identified as prioritised industries
- More focused sub-sector prioritisation required - in particular within the “engineering industries”
- Necessity to grasp industrial basic information – *BMEI firm-level study should provide basic idea*
- Importance of upstream/downstream industrial linkages as suppliers and users; and geographical linkages
- Metal/steel industry: selection of process/technology according to downstream requirement and resource availability; capacity utilisation
- Engineering industries: technical/technological capability improvement is a key: *both elemental technology aspect and industrial managerial aspect (such as Kaizen)*

Thank you



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“Inclusive and Dynamic Development”