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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Metal/Engineering industrial master plans in selected countries – Examples: (1) As a part of an industrial master plan, (2) As a BMEI-related sub-sector specific master plan

Metal/Engineering industrial master plans in selected countries – Findings on style and contents

Ethiopia’s BMEI policy framework: (1) PASDEP II - trade and industry chapter, (2) BMEI strategy, (3) BMEI firm-level study, (4) BMEI master plan

Some implications for Ethiopia’s BMEI
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

  - 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

  - Motorcycle industry including its supporting industries
### Indonesia: National Industrial Development Policy – Priority Sectors

<table>
<thead>
<tr>
<th>No.</th>
<th>Industrial Size</th>
<th>SMI</th>
<th>Future Leading Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small, Medium and Large-Sized Industries (SMI, ML)</td>
<td>Snack, Small industry-produced Salt</td>
<td>A. Agro Industry</td>
</tr>
</tbody>
</table>

#### Priority Industries (2004 – 2009)

1. Food and Beverages
   - Cocoa Processing & Chocolate
   - Fruit Processing
   - Coconut Processing
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
10. Electric Machinery and Equipment
11. Steel
12. Plant, Construction and Mining Machineries and Equipment
13. Agricultural Equipment/Machinery
14. Cement
15. Consumer Electronics
16. Ceramics
17. Essential Oil
18. Handicraft and Art Objects
19. Precious Metal and Jewelry
20. Earthenware/Decorative Ceramics

### BMEI equivalent sub-sectors

(Source) [www.depperin.go.id/ENG2006/default.aspx](http://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

Categorised as « Future Leading Industries »
Indonesia: National Industrial Development Policy – Framework by sector

<table>
<thead>
<tr>
<th>Core Industry</th>
<th>Supporting Industry</th>
<th>Related Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler, pressure vessel, heat exchangers, mechanical tool, construction machinery, mining processing machinery</td>
<td>Factory equipment component, steel plate, design, piping/tube, welding, control component</td>
<td>Factory, power plant, EPC.</td>
</tr>
</tbody>
</table>

**Mid-term targets (2004-2009)**
1. To improve utilization of the installed capacity to about 75%
2. To develop domestic research and development activities in the field of factory equipment
3. To increase the role of national EPC contractors from subcontractors to main contractors
4. To increase investment in mechanical tools and mining machinery

**Long-term target (2010-2025)**
1. To have the capacity to manufacture various types of basic designed and engineered equipment, mechanical tools, and mining processing equipment
2. 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.

1. To work with overseas companies in the development of industry of factory equipment and its components and mechanical tools;
2. To make and apply SNI of factory equipment in order to secure domestic market;
3. To encourage investment in industry of metal mechanical tools and mining equipment.

**Basics of Long-Term Action Plan (2010-2025)**
1. To make all types and specification of machineries needed by manufacturing and mining industry;
2. To use cooperation with overseas sources to get access to overseas market.

**Supporting Elements:**

**Market:**
- To increase promotion to Asian and African countries for the purpose of Non-block and South-South Cooperation;
- To use domestic market potential.

**Human Resources:**
To improve the skill of human resources in the field of manufacture.

**Infrastructure:**
- 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.

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

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

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**One sheet per sub-sector**
[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

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

**Vision 2030**

**Fifth National Development Plan (2006-2010):** *Upstream/downstream manufacturing activities based on mining & agro-industry*

**Commerce, Trade and Industrial Policy (CTI Policy) 2009-(10 years)**

- **Policy Framework**
- **Industrial Policy**
  - Com&Trade Policy
  - Inv. Promo. Policy
  - Thematic Issues

**Vision:** to develop a competitive, export-led manufacturing sector that contributes 20% of GDP by 2015

**Priority Sectors**
1. Processed Foods (60% of manufacturing GDP)
2. Textiles and Garments (15% of manu.GDP)
3. **Engineering Products** (14% of Non Trad. Exp)
4. Gemstones (10% of NTE)
5. Leather and Leather Products (3% of NTE)
6. Wood and Wood Products (8% of manu.GDP)

**Industrial Strategy**
*To be prepared as a vehicle to implement Industrial Policy*

(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.
[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
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
  - 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
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

[Example] **Malaysia: Third Industrial Master Plan (IMP3) (2006-20) – Strategic thrust for metals industry**
2. Ethiopia’s BMEI policy framework and some implications for Ethiopia’s BMEI
Ethiopia

BMEI policy framework

PASDEP (2005/06-2009/10)  PASDEP II (2010/11-2014/15)

PASDEP II Preparation

BMEI documents: draft prepared by MPDC

BMEI Strategy (2007/08)  BMEI Firm-level Study (2010 First half)  BMEI Master Plan (2010 Second half?)

Jointly supported by ecbp and JICA

Considered to be supported by JICA
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 \( \Rightarrow \text{need for the Firm-level Study} \)
- 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
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


Geographical strategies

- Visualising and mapping geographical strategies for industrial clustering and transportation of raw material, import goods, supplied component, final products: Nationally and Regionally

[Example] ASEAN Map: Iron ore, steel mills, ports/roads

(Source) SEAISI (2009)
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.

(Source) JICA (1997)
Steel intensity (IISI/WSA)

(Source) Kawabata (2005)
<table>
<thead>
<tr>
<th></th>
<th>Setting targets and specifying products, producers, investment, technology, location, markets, etc.</th>
<th>Greater scope for government</th>
<th>Greater scope for markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial capital investment (sunk cost)</td>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Gestation period</td>
<td></td>
<td>Long</td>
<td>Short</td>
</tr>
<tr>
<td>Market volatility</td>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Product type</td>
<td></td>
<td>Industrial inputs</td>
<td>Consumer goods</td>
</tr>
<tr>
<td>Private sector maturity and dynamism</td>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Government policy capability</td>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Trust between government and business</td>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

(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

JICA’s VISION
“Inclusive and Dynamic Development”