Basic Metal and Engineering Industries
Firm-Level Study:
Results of parts conducted by JICA/MPDC
5th High Level Forum on Industrial Development in Ethiopia

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With JICA experts in charge:
- Mr Kyoji Uzuka (Basic Metal)
- Mr Eizo Maeda (Eng. Industries)
Contents of today’s presentation

- **Outline** of the Basic Metal and Engineering Industries Firm-Level Study
- Major findings from the JICA’s part: *basic metal industries*
- Major findings from the JICA’s part: *engineering industries* (part 2: *power sector and construction machinery industries*)
- **Recommendations** derived from the findings and conclusions
1. Outline of the Basic Metal and Engineering Industries Firm-Level Study
Period: February – June 2010
(JICA 2 Experts: from 12 April to 18 June)
Organisations: Metal Products Development Center (MPDC), Engineering Capacity Building Programme (ecbp) and JICA
Implementation:
- The MPDC team headed by the MPDC Head
- Phase 1 (field survey – collecting data and basic data processing): by MPDC and ecbp
- Phase 2 (analysis): The MPDC team supported by experts from ecbp (demand side – user industries) and JICA (supply side – BMEI industries) and MPDC local consultants
Field survey: 10 basic metal companies, 30 engineering companies, 10 user companies
It was requested to JICA in relation to the Ethiopia-Japan Industrial Policy Dialogue
Study flow
(provided at the Kick-off Meeting in MOTI in April)

1. INPUT NEED PASEP II
   - National Need
   - Technological Capability Building
     - Basic Metal
     - JICA
   - Engineering

2. PROCESS
   - Existing Capability Assessment
     - Identify Capability Required
     - IDENTIFY THE GAP
       - Provide Recommendation
         - Expansion
         - New
         - Support schemes
   - Firm-Level Intervention identified
   - New areas of investment identified
   - Experience of other countries and lessons drawn

3. RESULT
   - MOTI- MPDC- JICA-ecbMEls-Firm — Level Study
Table of contents of the study report

- **I. Background**: MPDC
- **II. Basic metal industries**: JICA with MPDC
- **III. Engineering industries (Part 1: Sugar and cement industries)**: ecbp
- **IV. Engineering industries (Part 2: Power and construction machinery industries)**: JICA with MPDC
- **V. Experience of other countries**: ecbp and JICA
- **VI. Summary of lessons, recommendations and conclusions**: ecbp and JICA
- **VII. Executive summary**: MPDC and ecbp
- **VIII. Annex. Processed data**: ecbp and JICA
II. Basic Metal Industries

- II-1. Iron ore exploration and possible utilization
- II-2. Material flow
- II-3. Existing capability assessment
- II-4. Identification of capability required
- II-5. Identification of the gap
- II-6. Technical recommendation on how to fill the gap
- II-7. Examples of other countries
- II-Annex.
  1. Analysis of questionnaire
  2. Company visit report
  3. Firm code – firm name list
Table of contents (JICA’s part) (2)

- **IV. Engineering Industries Part 2 (Power and Construction Machinery Industries)**
  - IV-1. Power sector
  - IV-2. Construction machinery industry
  - IV-Annex
    1. Experience of other countries
    2. Approach to casting industry
    3. Company visit report
Definition of Basic Metal and Engineering Industries

- **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 and Engineering Industries Sub-sector 5-Year Development Plan 2003-2007 EFY (BMEI 5-Year Plan)

- Prepared by Ministry of Trade and Industry (MOTI) / Metal Products Development Center (MPDC) in May 2010
- English version of the summary of the report prepared as an input for the PASDEP II, which is likely to put focus on BMEI as a prioritised industry for import substitution
- It identifies that 85% of the demand for BMEI products are currently fulfilled by imports.
- It sets various targets including: (i) Gross production value in 2014/15 to be 5 times of that in 2010/11; (ii) Steel demand to grow 28% p.a.; per capita steel consumption to grow from 12.1kg (EFY2002) to 34.72kg (EFY2007); (iii) future 5-year demand for BMEI products by major industrial sectors; (iv) domestic capacity targets (%) for each industrial sector and each year.
2. Major findings from the JICA’s part (Chapter II): Basic metal industries
II-1. Iron ore exploration and possible utilization

- Promising site: Bikilal Iron Ore Deposit (West Ethiopia) – estimated quantity 22 mil tons
- Two previous studies: (i) Ethio-Korean, 1988, (ii) Swedish Boliden Contech, 1995
- Relatively low Fe content (41%) but high TiO$_2$ (15-18%) and V$_2$O$_5$ (0.18%) contents, which increase the ore value
- Was not proved to be strictly economically feasible at that time but...
- Production cost is Birr2.5/kg (if converted in current price) which compares to steel scrap cost Birr3-5/kg

Recommendation: It is worth while re-investigating its feasibility under the current high mineral price situation.
World DRI production continues to increase as an alternative to the blast furnace-based integrated iron making in developing countries.

(Source) Ravenscroft, C., Midrex Technologies Inc., presented at 2010 SEAISI Conference

(Source) American Iron and Steel Institute
Direct Reduced Iron (DRI) (2)

Among various kinds of DRI production process have been developed, MIDREX has been the most major one while FASTMELT is updated energy-efficient process.

Recommendation:
Examine if any type of DRI is suitable for the current situation in Ethiopia through F/S.

(Source) Brochure of Midrex technologies, Inc
II-2. Material flow: Iron and steel in Ethiopia

- The steel industry heavily depends on raw material import.
- It tends to concentrate in the downstream sub-sectors.
- There are many missing data.

Recommendation: establish data collection system and clarify the material flow further so that appropriate intervention can be made.
II-3. Existing capability assessment (1)

- Production capacity of the major 14 BM companies exceeds 1 million tons. Half of them have been recently installed.

Production capacity and actual production in 2009/10 (Unit: ton)

<table>
<thead>
<tr>
<th>No.</th>
<th>Firm_code</th>
<th>Billet Attainable</th>
<th>Reinforce bar Attainable</th>
<th>Hollow section Attainable</th>
<th>Corrugate sheet Attainable</th>
<th>Wire Attainable</th>
<th>Nail Attainable</th>
<th>Total Attainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>2,300</td>
<td>460</td>
<td>1,000</td>
<td>200</td>
<td></td>
<td></td>
<td>3,300</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>13,000</td>
<td>3,900</td>
<td>13,500</td>
<td>9,800</td>
<td>30,000</td>
<td>18,000</td>
<td>61,500</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>22,000</td>
<td>9,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31,000</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
<td>100,000</td>
<td>36,000</td>
<td></td>
<td></td>
<td></td>
<td>136,000</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>35,000</td>
<td>10,500</td>
<td>156,200</td>
<td>52,900</td>
<td></td>
<td></td>
<td>241,200</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>9,600</td>
<td>2,900</td>
<td>6,823</td>
<td>6,650</td>
<td>1,700</td>
<td>520</td>
<td>24,369</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>72,000</td>
<td>21,600</td>
<td>108,000</td>
<td>27,000</td>
<td></td>
<td></td>
<td>180,000</td>
</tr>
<tr>
<td>8</td>
<td>E-12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>600</td>
<td>70</td>
<td>4,600</td>
</tr>
<tr>
<td>9</td>
<td>MA</td>
<td>48,000</td>
<td>12,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60,000</td>
</tr>
<tr>
<td>10</td>
<td>S-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35,000</td>
<td>16,000</td>
<td>51,000</td>
</tr>
<tr>
<td>11</td>
<td>S-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>904</td>
<td>138</td>
<td>1,042</td>
</tr>
<tr>
<td>12</td>
<td>S-5</td>
<td>7,200</td>
<td>6,700</td>
<td>2,430</td>
<td>1,897</td>
<td></td>
<td></td>
<td>18,037</td>
</tr>
<tr>
<td>13</td>
<td>S-7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>800</td>
<td>580</td>
<td>1,380</td>
</tr>
<tr>
<td>14</td>
<td>ST</td>
<td>120,000</td>
<td>36,000</td>
<td>280,000</td>
<td>84,000</td>
<td></td>
<td></td>
<td>400,000</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>249,600</td>
<td>74,900</td>
<td>664,523</td>
<td>216,150</td>
<td>87,500</td>
<td>37,160</td>
<td>1,113,783</td>
</tr>
</tbody>
</table>

New facilities installed in the last five years (Unit: ton)

<table>
<thead>
<tr>
<th>No.</th>
<th>Firm_Code</th>
<th>Product</th>
<th>Capability (ton/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Hollow section, corrugate sheet, reinforced bar</td>
<td>43,500</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Reinforced bar</td>
<td>60,000</td>
</tr>
<tr>
<td>3</td>
<td>N/A</td>
<td>Hollow section</td>
<td>20,000</td>
</tr>
<tr>
<td>4</td>
<td>ST</td>
<td>Reinforced bar</td>
<td>280,000</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>Reinforced bar, sections</td>
<td>108,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>511,500</td>
</tr>
</tbody>
</table>

(Source) questionnaire and hearing by the Study team
Iron and steel manufacturing processes which are covered by Ethiopia are still limited and need to be explored toward upstream processes.

Basic metal companies surveyed

- **Basic metal industries (14 companies):**
  - Billet (5 companies)
  - Reinforced bar (6 companies)
  - Hollow section (4 companies)
  - Corrugate sheet (6 companies)
  - Wire (3 companies)
  - Nail (4 companies)
II-4. Identification of capability required

- According to the 5-year projection, steel consumption grows 28% p.a. and 2014/15 demand will reach 3 million ton.

Steel consumption projection

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (million)</td>
<td>-</td>
<td>81.7</td>
<td>83.7</td>
<td>85.7</td>
<td>87.8</td>
<td>89.9</td>
</tr>
<tr>
<td>Population growth (%)</td>
<td>-</td>
<td>2.4</td>
<td>2.4</td>
<td>2.5</td>
<td>2.5</td>
<td>2.4</td>
</tr>
<tr>
<td>Average crude steel</td>
<td>12.1</td>
<td>14.23</td>
<td>17.78</td>
<td>22.23</td>
<td>27.75</td>
<td>34.72</td>
</tr>
<tr>
<td>consumption (kg)</td>
<td>-</td>
<td>17.6</td>
<td>24.9</td>
<td>25.0</td>
<td>24.8</td>
<td>25.1</td>
</tr>
<tr>
<td>Average crude steel</td>
<td>-</td>
<td>17.6</td>
<td>24.9</td>
<td>25.0</td>
<td>24.8</td>
<td>25.1</td>
</tr>
<tr>
<td>consumption growth (%)</td>
<td>-</td>
<td>2.4</td>
<td>2.4</td>
<td>2.5</td>
<td>2.5</td>
<td>2.4</td>
</tr>
<tr>
<td>Demand for steel (ton)</td>
<td>908,385</td>
<td>1,162,733</td>
<td>1,488,298</td>
<td>1,905,021</td>
<td>2,437,427</td>
<td>3,121,187</td>
</tr>
<tr>
<td>Demand for steel growth (%)</td>
<td>-</td>
<td>28.0</td>
<td>28.0</td>
<td>28.0</td>
<td>27.9</td>
<td>28.1</td>
</tr>
</tbody>
</table>

(Source) MOTI/MPDC (2010) Metal and engineering industries 5-year plan etc.
II-5. Identification of the gap

According to the 5-year projection, domestic production will grow faster than the steel consumption grow. This will result surpassing the total demand in 2014/15.

(Source) MOTI/MPDC (2010) Metal and engineering industries 5-year plan etc.

<table>
<thead>
<tr>
<th></th>
<th>Billet</th>
<th>Bar</th>
<th>Hollow</th>
<th>Corrugate</th>
<th>Wire</th>
<th>Nail</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009/10</td>
<td>74,900</td>
<td>216,150</td>
<td>37,160</td>
<td>37,597</td>
<td>728</td>
<td>6,024</td>
<td>372,559</td>
</tr>
<tr>
<td>2010/11</td>
<td>140,438</td>
<td>405,281</td>
<td>69,675</td>
<td>70,494</td>
<td>1,365</td>
<td>11,295</td>
<td>698,548</td>
</tr>
<tr>
<td>2011/12</td>
<td>182,569</td>
<td>526,866</td>
<td>90,578</td>
<td>91,643</td>
<td>1,775</td>
<td>14,684</td>
<td>908,113</td>
</tr>
<tr>
<td>2012/13</td>
<td>237,339</td>
<td>684,925</td>
<td>117,751</td>
<td>119,135</td>
<td>2,307</td>
<td>19,089</td>
<td>1,180,546</td>
</tr>
<tr>
<td>2013/14</td>
<td>356,009</td>
<td>1,027,388</td>
<td>176,626</td>
<td>178,703</td>
<td>3,460</td>
<td>28,633</td>
<td>1,770,819</td>
</tr>
<tr>
<td>2014/15</td>
<td>712,018</td>
<td>2,054,776</td>
<td>353,252</td>
<td>357,406</td>
<td>6,921</td>
<td>57,266</td>
<td>3,541,639</td>
</tr>
<tr>
<td></td>
<td>20.1</td>
<td>58.0</td>
<td>10.0</td>
<td>10.1</td>
<td>0.2</td>
<td>1.6</td>
<td>100.0</td>
</tr>
</tbody>
</table>
II-6. Technical recommendation how to fill the gap (1)

Scenario to achieve domestic production growth and import substitution

- Increasing existing capacity utilisation to fill the demand (by decreasing power cut)
- Expanding domestic production processes toward upstream semi products
- Widening domestic downstream production lineup
- Establishing iron making process such as DRI
- Investment
- Kaizen
- Existing production capacity

Japan International Cooperation Agency
II-6. Technical recommendation how to fill the gap (2)

- Widening domestic downstream production lineup

Sequential order example:
Cold rolled coil & sheet → heat treatment, galvanising & coating → pipe & tube → hot rolled sheet & coil

(Source) American Iron and Steel Institute
II-6. Technical recommendation how to fill the gap (3)

Basic metal products technological development scenario

![Diagram showing metal products development stages]

- Iron making
- Steel making
- Continuous casting
- Hot rolling
- Cold rolling
- Others

- Short-term
- Mid-term
- Long-term
II-7. Examples of other countries (1)

- **Minimum efficient scale** and **initial investment cost** for major process according to other countries’ experience
  - Conventional
    - Simple rolling of steel bars and shapes: 100,000 t/y (US$20 million)
    - Steel rolling companies which uses electric furnace: 300,000 t/y (US$100 million)
    - Simple rolling and hot strip milling of steel sheets: 2 million t/y (US$400 million)
    - Blast furnace - integrated steel mill: 3 million t/y (US$4 billion)
  - Alternative
    - Hot coil production based on electric furnace and thin slab continuous casting: 1 million t/y (US$300 million)
    - Direct reduction method: 0.5-1.0 million t/y (US$100 million)

II-7. Examples of other countries (2)

Southeast Asian countries have different experiences according to their historical situations

- Example 1. Indonesia
  - State enterprise-led integrated production system at a turning point
  - One of a few countries which realised direct reduced iron integrated production (natural gas based)
  - Large market potential with 230 million population and less per capita steel consumption (29kg, compared to Thailand 228kg, Vietnam 65kg)
  - Struggling with high cost structure and weak competitiveness

- Example 2. Vietnam
  - Government of Vietnam requested Government of Japan to provide assistance for master plan making in order to develop domestic steel industry
  - Key recommendations: preferential tax system; maintaining of integrated steel mill competitiveness; infrastructure development; advanced technologies; quality improvement; state-owned companies reform; environmental conservation

3. Major findings from the JICA’s part (Chapter IV): Engineering industries (part 2) – Power sector and construction machinery industries –
IV-1-1. Overview of the **power sector**

- Current capacity: 1,600MW
- Hydro (86%), Diesel (13%), Geothermal (1%)
- Frequent power cut is a major obstacle for industries
- Ethiopian Electric Power Corporation (EEPCO)’s plan: 11,600MW to be newly developed = Hydro (10,710MW) + Wind (540MW) + Geothermal (350MW)
  (according to the Study analysis based on EEPCO data)
- Estimated potential 60,000MW in total: Hydro (45,000MW), Wind (10,000MW), Geothermal (5,000MW)
IV-1-2. Existing technical capability

- Major part of power facility/equipment depends on import or foreign companies’ engineering services as “full turn key basis”
- Domestic companies focused
- Examples of domestic production experience
  - Penstock
  - Accessories for middle voltage transmission
  - High voltage transmission tower (prototype)
  - Wind power facilities (approaching)
IV-1-3. Identification of technical capability required (1)

- **BMEI 5-Year Plan**
  - 5-Year demand for BMEI products – 860,112 mil. Birr
  - 5-Year gross value of domestic production – 430,056 mil. Birr (Domestic capacity target 50%) = Power sector provides 75% of whole demand from all major industries

- **EEPCO’s new strategies on increasing domestic procurement**
  - “Detailed Technical Requirement for Power Transformers and Steel Structures”

- **Demand for steel fabrication in power plant and transmission tower**
  - Study analysis shows 650,000t demand in next 5 years
  - Plan for extension of 2,440km transmission line
  - Emerging demand for wind power farms – transportation advantage for domestic companies
IV-1-3. Identification of technical capability required (2)

- Concrete demand for metal and engineering products by EEPCO – various kinds of long and short lists
  - List of machinery/equipment and metal products for a typical hydropower plant (258MW)
  - List of parts and materials for Finchaa-Amerti-Neshe multi purpose project
  - List of BMEI parts and components necessary for rural electrification and distribution
  - List of machinery/equipment/metals/instruments for procurement at the EEPCO mechanical workshop for 5 years after 2010

An example of accessories - Spacer
IV-1-4. Technical recommendation on how to fill the gap (1)

Required technological capability and Acquired technology

- Power production
  - Intake gate
- Power transmission
  - Pen stock
  - High-grade pen stock
  - Low P pipe
  - High V cable
  - High V tower
  - M/L V tower
  - Accessories
- Power distribution
  - Transformer parts
  - Switchboard parts
  - Prototype
  - Accessories
IV-1-4. Technical recommendation on how to fill the gap (2)

BMEI related components newly required for hydro-power/wind power sector: possible scenario

- Pen stock
  - Design
  - Manufacturing
  - Steel making

- High Voltage tower
  - Design
  - Manufacturing
  - Steel making

- Accessories
  - Design
  - Manufacturing

- Wind Power tower
  - Manufacturing
  - Design
  - Manufacturing
  - Steel making

Product series

Short term Year Long term
## Capacity, gap and recommendations on major power equipment

<table>
<thead>
<tr>
<th></th>
<th>Capability</th>
<th>Gap analysis</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydro Power plant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penstock</td>
<td>2 companies have actual result</td>
<td>Correspondence for advanced technology</td>
<td>Upgrading in technology and equipment</td>
</tr>
<tr>
<td></td>
<td>(other company)</td>
<td>Huge gap</td>
<td>Technical cooperation / Equipments</td>
</tr>
<tr>
<td>Intake liners etc</td>
<td>Irrigation gate (1 company)</td>
<td>Not so large</td>
<td>Upgrading in technology and equipment Design is important.</td>
</tr>
<tr>
<td><strong>Wind power plant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tower /Column</td>
<td>3 companies approach.</td>
<td>Current status unknown</td>
<td>-</td>
</tr>
<tr>
<td><strong>Transmission/ Distribution tower and accessories</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High V Tower</td>
<td>A prototype (1 company)</td>
<td>New guide line of EEPCO</td>
<td>Adjustment for the guide line. Standardization.</td>
</tr>
<tr>
<td>Middle V Tower</td>
<td>(other company)</td>
<td>New guide line of EEPCO</td>
<td>Design/equipment according to the guide line. Standardization.</td>
</tr>
<tr>
<td>High V Accessories</td>
<td>(other company)</td>
<td>Huge</td>
<td>Design/equipment according to the guide line.</td>
</tr>
<tr>
<td>Middle V Accessories</td>
<td>Actual result (1 company)</td>
<td>New guide line</td>
<td>Zinc dip equipment. Upgrading by coupling of insulator.</td>
</tr>
<tr>
<td>Transformer</td>
<td>(other company)</td>
<td>Huge</td>
<td>Technical cooperation / Equipments.</td>
</tr>
<tr>
<td><strong>General equipments/ machine</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spare parts</td>
<td>Actual result (1 company)</td>
<td>Small gap. But not for any kind of spare parts.</td>
<td>How to break the limit. (Rapid modeling etc)</td>
</tr>
</tbody>
</table>
IV-1-4. Technical recommendation on how to fill the gap (3)

General technical recommendations (i)

- Strengthening of design capacity
  - Training / capacity building of design engineer
  - Disseminating CAD/CAE
  - Wind power facility as a large potential for designing
  - Standardisation of specification, etc.

- Development of new products
  - Concrete products to be developed: for example, penstock, water gate and valve for dam, transformer, induction motor / direct current synchronised motor etc.
  - Feasibility study on domestic production of motors
  - High voltage transmission products
  - Various parts for wind power generation system
  - Existing capacity utilisation and joint product development, etc.
IV-1-4. Technical recommendation on how to fill the gap (4)

General technical recommendations (ii)

- **Management**
  - QA/QC system, inspection ability, preventive maintenance
  - Kaizen
  - Utilisation of MPDC as an incubator
  - Human resource development on basic elemental technology

- **Others**
  - More opportunities for domestic engineering companies to be engaged in public investment projects as required
  - Electricity stabilisation
  - Cooperation with Ethiopian Association of Basic Metals and Engineering Industry
  - Reverse exhibition
IV-1-4. Technical recommendation on how to fill the gap (5)

Technical recommendations for some identified companies
(Example of Company A)

- Capacity analysis
  - Huge capacity in terms of quantity of machinery, available production process etc.
  - 65% of total sales – middle/low voltage transmission accessories, etc.

- Expected products to be developed/produced
  - Water gate and its valve, gear box for gate
  - Core part of transformer such as conductor wire
  - Distribution panel/board, transformer container, motor, etc.

- Recommendations
  - Designing technology upgrade
  - Technical collaboration with other companies
  - Galvanising by the hot dip process of zinc to be required.
  - Casting technology improvement, etc.

[Recommendations for some other companies are also available in the report]
IV-2-1. Overview of the construction machinery industry

- Can be classified into two groups
  - **Type A**: simple design; for housing/building construction; portable; many domestic manufacturers existing
  - **Type A** typical machinery: portable concrete mixer; hollow block making machine (HBM); jaw crusher
  - **Type B**: heavy duty; for road construction and large concrete structure; with wheels; almost all imported
  - **Type B** typical machinery: Concrete mixer lorry, motor grader, road roller etc.

(Above) portable concrete mixer. (left) HBM. (below) concrete mixer lorry
IV-2-2. Existing technical capability

- **Type A**: almost all the process are available domestically including steel welding, machining, gear making by casting and gear cutting. No bottlenecks are observed including parts supply and man power/skill. Enough number of makers for local demands.

- **Type B**: produced by only a handful countries. Very difficult to enter this market. Except for concrete mixer lorry, which could be locally fabricated if there are some demands.

(Source) Brochure of Midrex technologies, Inc
IV-2-3. Identification of technical capability required

- Continuous demand for Type A machinery.
- Some demand for concrete mixer lorry: imported amount in 2008 is 894 tons (if the average lorry size is 8 tons, 112 lorries).
- No significant visible demand for high level Type B products. However, spare parts demand for these are high.

(Source) Brochure of Midrex technologies, Inc
IV-Annex. Experience of other countries

- Technology development in local firms
  - Some examples including an Indian company adopted Toyota production system including TQM and Kaizen
- JICA projects on casting technology
  - Examples of the projects in Brazil, Indonesia, Ghana

- Approach to casting industry in Ethiopia: Recommendations

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<tr>
<th>How to get good cost cycle:</th>
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<td>Cost down ➔ Increasing order ➔ Increasing production ➔ Cost decrease</td>
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**New products development**

- Civil engineering: Offering new design.
- Development of agricultural equipment: Irrigation. Pump.
- Cooperation with machine maker: Axle shaft drum, hub (Imported), Balance weight for tractor (Imported), Incinerator (Big volume of grates)
- Export of machined parts. (engine parts)
- Export of machined and assembled parts.
Recommendations and Conclusions

- Ethiopia’s basic metal and engineering industries have promising potential to contribute as an import substitution industry.
- Development scenario with investment for the basic metal industries are various: (i) iron making using Bikilal ore with direct reduced iron method should be re-examined; (ii) widening downstream domestic production line up should be pursued; (iii) expanding toward upstream process should strengthen the steel industry.
- Major part of the huge demand for the BMEI products for the power sector, the top consumer of the engineering products in the next 5-years, are currently fulfilled by import but there are various products which could be domestically produced in future.
- Asian and other countries’ experience could provide useful lessons.
- Technical capability and human resource development, particularly on basic elemental technology such as casting, are fundamental to create sound industrial base. Quality/productivity improvement such as Kaizen should complement from managerial aspect.
- Designing capacity enhancement is also required to exit from “full turn key” dependent situation which disturbs industrial development.
Thank you

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“Inclusive and Dynamic Development”