UN DESA Capacity Development Project on Belt and Road Initiative and SDGs meeting with the CCIEE delegation

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UN Sustainable Development Goals

- From 8, 18, 48 to 17, 169, 231
- Potential 14,196 interactions
- Sinergies / Trade-offs
- Multiple feedback loops (direction, strength, probability)
- Leverage points
- Nonlinearities
- Time lags
- Prioritization?
SDG Network of targets
Infrastructures and SDG Network

- Infrastructures were almost absent from MDGs
- Over 100 SDG targets are directly or indirectly related to infrastructures
- Infrastructure-related targets are among the most expensive
## Correlation patterns across countries

| HDI | GDP pc, PPP, constant US$ | Access to electricity, rural(% of total, rural) | Access to electricity, urban(% of total urban) | Agricultural irrigated land | Improved sanitation, rural(% of rural population with access) | Improved sanitation, urban(% of urban population with access) | Improved water source, rural(% of rural population with access) | Improved water source, urban(% of urban population with access) | CO2 emissions per capita(metric tons per capita) | Electricity production from renewable sources, excluding hydroelectric (% of total) | Energy use per capita(kg of oil equivalent per capita) | Gross fixed capital formation, % of GDP | Electric power transmission and distribution losses (% of output) | CO2 emissions from transport (% of total fuel combustion) |
|-----|---------------------------|-----------------------------------------------|-----------------------------------------------|----------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-----------------------------------------------|-------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| HDI | 1                         |                                               |                                               |                            |                                                 |                                                 |                                                 |                                                 | 0.54                                          | 0.51                                            | 0.51                                          | 0.51                                          | 0.51                                          | 0.51                                          |
| GDP pc, PPP, constant US$ | 0.69 | 1.00 |                                           |                                               |                                                 |                                                 |                                                 |                                                 |                                               |                                                 |                                               |                                               |                                               |                                               |
| Access to electricity, rural(% of total, rural) | 0.76 | 0.37 | 1.00                                      |                                               |                                                 |                                                 |                                                 |                                                 |                                               |                                                 |                                               |                                               |                                               |                                               |
| Access to electricity, urban(% of total urban) | 0.51 | 0.27 | 0.79 | 1.00                                      |                                                 |                                                 |                                                 |                                                 |                                               |                                                 |                                               |                                               |                                               |                                               |
| Agricultural irrigated land | -0.13 | -0.22 | -0.12 | -0.11 | 1.00                                      |                                                 |                                                 |                                                 |                                               |                                                 |                                               |                                               |                                               |                                               |
| Improved sanitation, rural(% of rural population with access) | 0.81 | 0.50 | 0.81 | 0.62 | -0.03 | 1.00                                      |                                                 |                                                 |                                                 |                                               |                                                 |                                               |                                               |                                               |
| Improved sanitation, urban(% of urban population with access) | 0.78 | 0.45 | 0.85 | 0.67 | -0.02 | 0.88 | 1.00                                      |                                                 |                                                 |                                                 |                                               |                                               |                                               |                                               |
| Improved water source, rural(% of rural population with access) | 0.77 | 0.46 | 0.79 | 0.55 | -0.31 | 0.74 | 0.76 | 1.00                                      |                                                 |                                                 |                                               |                                               |                                               |                                               |
| Improved water source, urban(% of urban population with access) | 0.60 | 0.35 | 0.62 | 0.31 | -0.19 | 0.61 | 0.66 | 0.78 | 1.00                                      |                                                 |                                               |                                               |                                               |                                               |
| CO2 emissions, per capita(metric tons per capita) | 0.54 | 0.78 | 0.35 | 0.26 | -0.19 | 0.43 | 0.38 | 0.36 | 0.27 | 1.00                                      |                                                 |                                               |                                               |                                               |
| Electricity production from renewable sources, excluding hydroelectric (% of total) | 0.16 | 0.12 | -0.16 | -0.38 | -0.10 | -0.10 | -0.20 | -0.02 | -0.01 | -0.15 | 1                                      |                                                 |                                               |                                               |                                               |
| Energy use per capita(kg of oil equivalent per capita) | 0.51 | 0.80 | 0.32 | 0.24 | -0.31 | 0.39 | 0.36 | 0.34 | 0.28 | 0.98 | -0.12 | 1.00                                      |                                                 |                                               |                                               |
| Gross fixed capital formation, % of GDP | -0.20 | -0.19 | -0.18 | -0.16 | 0.24 | -0.32 | -0.23 | -0.22 | -0.02 | -0.08 | -0.16 | -0.03 | 1.00                                      |                                                 |
| Electric power transmission and distribution losses (% of output) | -0.56 | -0.47 | -0.31 | -0.19 | 0.41 | -0.35 | -0.34 | -0.45 | -0.27 | -0.39 | -0.07 | -0.40 | 0.09 | 1.00                                      |
| CO2 emissions from transport (% of total fuel combustion) | -0.31 | -0.16 | -0.39 | -0.36 | 0.26 | -0.33 | -0.34 | -0.36 | -0.24 | -0.38 | 0.30 | -0.34 | -0.14 | 0.31 | 1.00                                      |
Key components of an integrated development framework

- **Environment**
  - Infrastructures
  - Emissions
  - Energy
  - Biodiversity
  - Natural Disasters

- **Institutions**
  - Government
  - Markets
  - Laws
  - Good Governance

- **Social**
  - Infrastructures
  - Poverty
  - Inequality
  - Demography
  - Gender

- **Technology**
  - Infrastructures
  - R&D
  - Innovation
  - Patents

- **Economy**
  - Infrastructures
  - Productivity
  - Factors
  - Prices
  - Financing
## Modelling options

<table>
<thead>
<tr>
<th>Modelling Tools</th>
<th>Time horizon</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short</td>
<td>Medium</td>
<td>Long</td>
</tr>
<tr>
<td>Spreadsheet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macroeconometric</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Dynamics</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Typical structure of a macro model
The WEFM Model

• The WEFM model is a large scale macro-econometric model containing 161 individually estimated country models linked together by a trade matrix, built by staff at UN-DESA. It has been regularly used to produce forecasts and scenarios as inputs to DESA’s WESP since 2009

• Countries are connected mainly through trade linkages

• The modelling philosophy:
  ⇒ Uses more Economic theory: short-term demand-side rigidities and long-term supply side aspects
  ⇒ Uses Cointegration-Error correction methods: with theory embedded in the long run cointegrating relations and short equation used to and to fit the data
  ⇒ Endogenizes policy variables
  ⇒ Accounting system
The WEFM Model(2)

- There are three agents: Households, firms and government plus an external sector.
- Household behaviour yields a consumption function relating consumption to terms of trade adjusted GDP. In addition, increasing/decreasing inflation dampens/stimulates consumption spending.
- Firm behaviour is represented by an investment equation relating investment spending to terms of trade adjusted GDP and a trend output equation.
- Labour force equation is not linked to consumer behaviour, but is separately specified.
- Labour employment is derived indirectly via Okun’s Law, which relates the rate of unemployment to GDP. Given the rate of unemployment and the labour force, employment is derived by identity.
- The government sector receives revenue via taxes and spends via government consumption.
- The size of the output gap impacts on prices, via a Phillips curve, which is vertical in the long run, closing the model.
- For a full description of the WEFM see Altshuler, Holland, Hong and Li (2016).
The Supply Side

• The foundation of the supply side in the WEFM model is a neoclassical production function
  ⇒ potential GDP (trend GDP)
  ⇒ Potential – Actual GDP = Output Gap
  ⇒ Phillips curve => prices
• Cobb-Douglas production function with constant returns to scale and labour-augmenting technical progress
• output is $Y_t$, capital stock is $K_t$ and labour is $L_t$
• $\alpha$ is a constant scale parameter, $\beta$ is the constant elasticity of output with respect to capital, and $A_t$ is labour-augmenting technical progress (total factor productivity(TFP))

\[
\ln(Y_t) = \ln(\alpha) + \beta \ln(K_t) + (1-\beta) \ln(L_t) + (1-\beta) \ln(A_t)
\]

• $A_t$ is fundamentally unobservable, but given $\alpha$ and $\beta$, it can be derived as a residual (the Solow residual)
• Technical progress can be further parameterized
• Growth of $A_t$ is a constant, $\gamma$, equal to the average rate of growth of labour productivity over the period or extended to equation. $\epsilon_t$ captures a changing rate of technical progress.

\[
\ln(A_t) = \gamma t
\]
\[
\ln(A_t) = \gamma (t + \epsilon_t)
\]
A preliminary application – Some Considerations

• Changes in investment spending impact on both the demand and supply sides of an economy

• On the demand side, increased investment impacts GDP via the Keynesian multiplier

• On the supply side, an increase in investment increases the capital stock and through the production function increases trend output. But infrastructure investment has an additional impact, via its direct contribution to TFP

• The interaction of demand and supply via prices then makes a further impact on GDP

• Scenario 1 analyses the impact of an increase in investment spending, without the TFP component. Scenario 2 adds the impact of TFP and demonstrates that the key long run effect on output comes from this. Scenario 3 adds regional integration effects.
Further Methodological Considerations

• Results depend crucially on a number of underlying assumptions, and highlights the interrelatedness of some of the elements of the Belt and Road Initiative

• Analysis is done under the assumption of fixed exchange rates. However, these scenarios look at the impact of large FDI flows which would typically lead to appreciating exchange rates in the receiving countries

• Overall the dominant impact of the infrastructure investment and the trade liberalization appears to come mainly from the impact on TFP. The “pure” investment component acts like a classic Keynesian spending multiplier with some additional boost from the increase in capital stock. The trade component, as currently calibrated, adds another boost to GDP, but as a level shift

• Is it possible that the impact on employment is not at the aggregate level but rather in movements between sectors and/or from informality to formality?
Some Thoughts on Upcoming Work

- A first step to sharpen the results is to gather more evidence of the impact of infrastructure projects on TFP and allow for different durations of projects.
- This could then be matched with additional information on the timing and amount of funding of the projects envisaged. Together these would allow a much more accurate calibration.
- Further model extensions needed such as:
  - Country-level calibration
  - Reliable data on infrastructure investments and FDI
  - Exchange rate assumptions
  - Enriching the model with SDG-related variables.
Additional analytical work: gravitational model

\[ \text{Export}_{ij,t} = \alpha_1 \text{GDPPC}_{i,t} + \alpha_2 \text{GDPPC}_{j,t} + \alpha_3 \text{POP}_{i,t} + \alpha_4 \text{POP}_{j,t} + \delta_1 \text{RTA}_{ij,t} + \delta_2 \text{CL}_{ij,t} + \delta_3 \text{Border}_{ij,t} + \alpha_5 \text{Dist}_{ij,t} + \alpha_6 \text{Rail}_{i,t} + \alpha_7 \text{Rail}_{j,t} + \alpha_8 \text{Air}_{i,t} + \alpha_9 \text{Air}_{i,t} + \alpha_{10} \text{ELEC}_{i,t} + \alpha_{11} \text{ELEC}_{j,t} + \alpha_{12} \text{TELE}_{i,t} + \alpha_{13} \text{TELE}_{j,t} + \alpha_{14} \text{INT}_{i,t} + \alpha_{15} \text{INT}_{j,t} + \alpha_{16} \text{GOV}_{i,t} + \alpha_{17} \text{GOV}_{j,t} + \varepsilon_t \]

- GDP per Capita
- Population
- Common Language
- Common Border
- Regional Trade Agreement
- Distance
- Railway distance
- Air transportation
- Electricity Accessibility
- Telephone Subscription
- Internet Connectivity
- Government Effectiveness
Strengthening national policy capacities for jointly building the Belt and Road towards the Sustainable Development Goals (SDGs)

- The Economic Analysis and Policy Division (EAPD) of the United Nations Department of Economic and Social Affairs (UNDESA) is implementing this project.
- A multi-country multi-year project, to strengthen national capacities for using macroeconomic modelling tools for analyzing development policies to achieve the Sustainable Development Goals (SDGs).
- Funded by the 2030 Agenda Sub-Fund of the UN Peace and Development Trust Fund.

Five Priorities of Belt & Road Initiative
UN DESA project on BRI and SDGs

1. BRI has the potential to promote inclusive growth and sustainable development.
2. Careful analyses of the potential socio-economic impacts on trade, investment, employment, growth, and the environment.
3. Build national capacity to use the forecasting and analysis tool.
4. Program activities in about 14 countries from 2018 to 2020.
Progress

➢ **Scoping missions:** June-October 2018 - Scoping missions to 7 countries (Bangladesh, Cambodia, Kazakhstan, Kyrgyzstan, Lao PDR, Myanmar, and Thailand)

➢ **Recruitment:**

Seven National Consultants (one from each pilot countries)

One International Consultant (Economic Modeler)

➢ **National Workshops:**

October 2018 - March 2019: First national workshops in those 7 countries

16 Oct 2018: the first national workshop in Kyrgyzstan has completed
Implementation & Coordination National Partners

- **Bangladesh**
  Planning Commission
  Policy Research Institute

- **Cambodia**
  Ministry of Commerce

- **Kazakhstan**
  Office of the President
  Kazakhstan Institute for Strategic Studies

- **Kyrgyzstan**
  Ministry of Economy

- **Lao PDR**
  Ministry of Planning
  National Institute for Economic Research

- **Myanmar**
  Ministry of Planning and Finance

- **Thailand**
  National Economic and Social Development Board
  Thailand Development Research Institute
Way Forward

➢ January-June 2019: Scoping missions and workshops in additional 7 countries (not selected yet)
➢ February-May 2019: Regional workshops in Beijing, Almaty, and/or Bangkok
➢ November 2018-July 2019: Global events in New York, Bali and/or Buenos Aires
➢ September 2019-December 2020: national, regional, and global workshops for 14 countries
Jointly Building Belt and Road towards SDGs

THANK YOU!