

Introduction to exercise in emission scenario building

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Malé Declaration: Emission inventory preparation / scenarios /
atmospheric transport modelling and soil acidification workshop
UNEP RRCAP, Bangkok, Thailand. 28 January to 1 February 2008

Outline

- Building emission scenarios for India
 - Base year: 2000 with inventory data from ???
 - Target year: 2030
- Pollutants covered
 - SO₂
 - NO_x
 - (PM)
- Focus on the power sector,
 - ...but the principles used in the exercise are also applicable to other sectors, such as transport, industry, etc.

Two stages

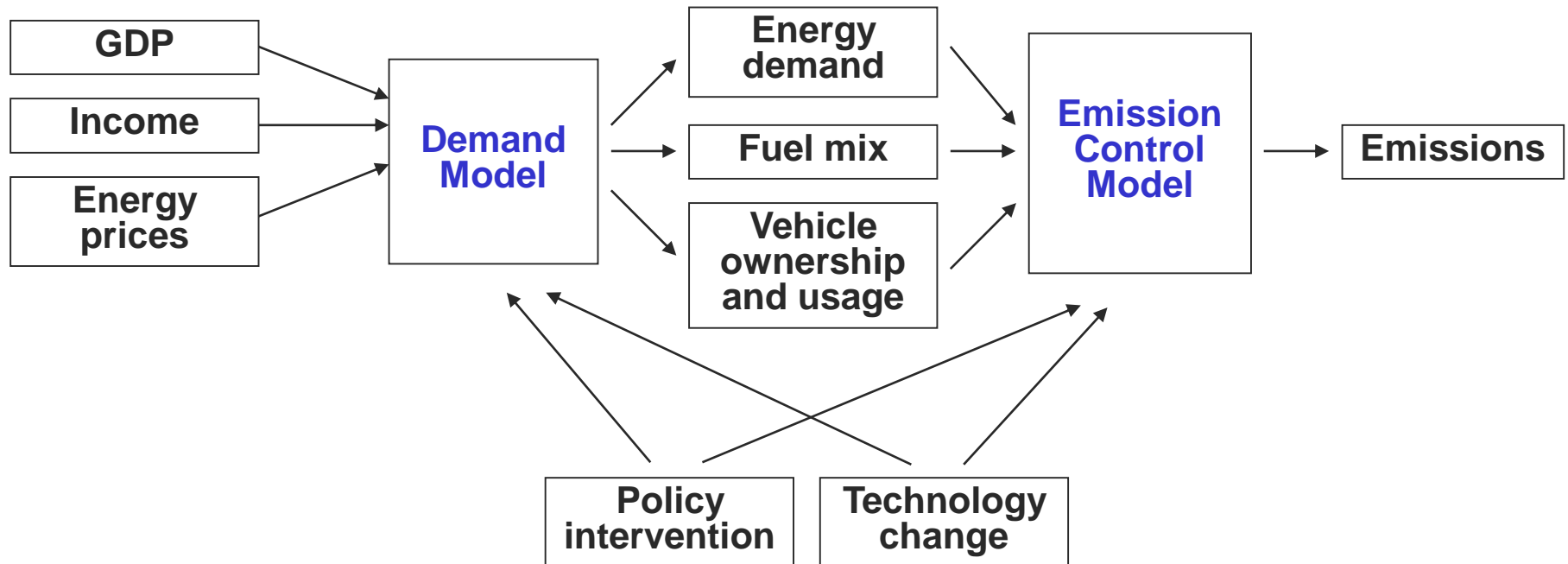
1. Modelling of energy demand
 - future energy / electricity demand
 - future emission factors in the power sector
 - using dedicated Excel spreadsheet

2. Building emission scenarios
 - using Malé Emission Inventory handbook version 2.4 with new special scenario sheets
 - changing values for
 - fuel demand
 - effectiveness of emission control > emission factors

Key goals of the exercise

- Becoming familiar with the basics of energy and emission scenario building
- Assessing the effect of policy intervention
 - Reference Scenario vs. Alternative Policy Scenario
- Understanding data requirements for the building of emission scenarios
- Creating a vision for a “cleaner” future

Building energy and emission scenarios



Three scenarios

■ Reference Scenario

- Only changes in the activity rate and fuel mix are considered, emission factors do not change
- Changes in the activity rate and fuel mix as above, additionally emission factors change due to introduction of more efficient and cleaner technology through market forces (no policy intervention)

■ Alternative Policy Scenario

- Changes in the activity rate as above, additionally due to NEW POLICIES, the fuel mix changes towards cleaner fuels and emission factors are lower

■ High Growth Scenario

- GDP growth rate is 2% higher. Other parameters are free to choose.

Overview of Scenarios in this exercise

	Reference Scenario 1	Alternative Policy Scenario	High Growth Scenario
Average GDP growth	6.5 % per year	6.5 % per year	2 % higher than in the other scenarios
Fuel mix changes	yes	yes	
Emission factors change	no	Yes, due to "additional policy intervention"	no

Reference Scenario - Storyline

- Average annual **GDP** growth rate of 6.5 %
- **Energy intensity** decreases by 2.5 % / year on average
- **Fuel mix** changes slightly towards natural gas, nuclear power, and renewables. Base your decision on factors such as...
 - Recent trends in your country with changes in the fuel mix (e.g. switch to CNG)
 - Energy policies and strategies
 - Availability of local resources and energy security concerns
 - Typical pathways of developing economies (e.g. decrease of non-commercial biomass, switch to cleaner fuels and electricity)
- The energy losses in the **electric distribution system** remain unchanged at 30%
- **No additional measures for emission control** are taken

Alternative Policy Scenario - Storyline

- GDP growth rate same as in the energy scenario.
- Due to additional measures in increasing energy efficiency, the **energy intensity** of the Indian economy decreases by 3.5% per year.
- The **fuel mix** changes stronger to natural gas, nuclear, and renewables than in the Reference Scenario.
- From 2010 onward, all coal-fired power stations (old and new) have to be equipped with a **wet scrubber** which captures 90% of the sulfur from the flue gas.
- From 2015 onward, all gas-fired power stations (old and new) have to be equipped with a **catalytic converter** which removes 80% of NOx from the flue gas.
- From 2015 onwards, **considerable investments into the electric distribution system** are made; as a consequence, losses are reduced to 15% by 2030.
- From 2020 onwards, due to increased competition from foreign suppliers, all new coal-fired power plants use **super-critical technology**, with 43% electric efficiency.
- From 2025 onwards, the **cost for producing electricity from photovoltaic cells** are equal to the cost of producing electricity from coal.

Alternative Policy Scenario

- You may decide on other parameters according to **your own judgment**, e.g.
 - the rate and effectiveness of policy enforcement for pollution control
 - the power generation mix

High Growth Scenario

- GDP growth rate is **2%/year higher** than in the Reference and Alternative Policy Scenario
- All **other parameters** are **free to choose**. You may base your decisions on the assumption, that by 2030 the Indian society in this High Growth Scenario will be considerably “richer” than in the other two scenarios.

Tomorrow morning

- **Present your results** from the 3 Scenarios to the entire group
 - assumptions made and decisions taken
 - effects on energy demand and emissions
 - 5-10 minutes per group
- **Discussion** on
 - Limitations / uncertainties of emission scenarios
 - Learnings from the exercise
 - Applicability and usefulness of emission scenarios in your countries
 - Round-up and discussion of further needs

PLEASE...

- ...make changes only in the yellow cells!!! 😊
- Save your 3 scenarios under 3 different file names

ADDITIONAL SLIDES

- A scenario is **NOT a forecast...**
- ...but a view of the future based on a set of **well-defined driving forces and assumptions**
- ...getting the figures right might be less relevant if the **process** of conducting the scenario work is more important than the **output...**
 - stimulating stakeholders dialogue
 - understanding causalities and interrelations
 - awareness raising
 - capacity building

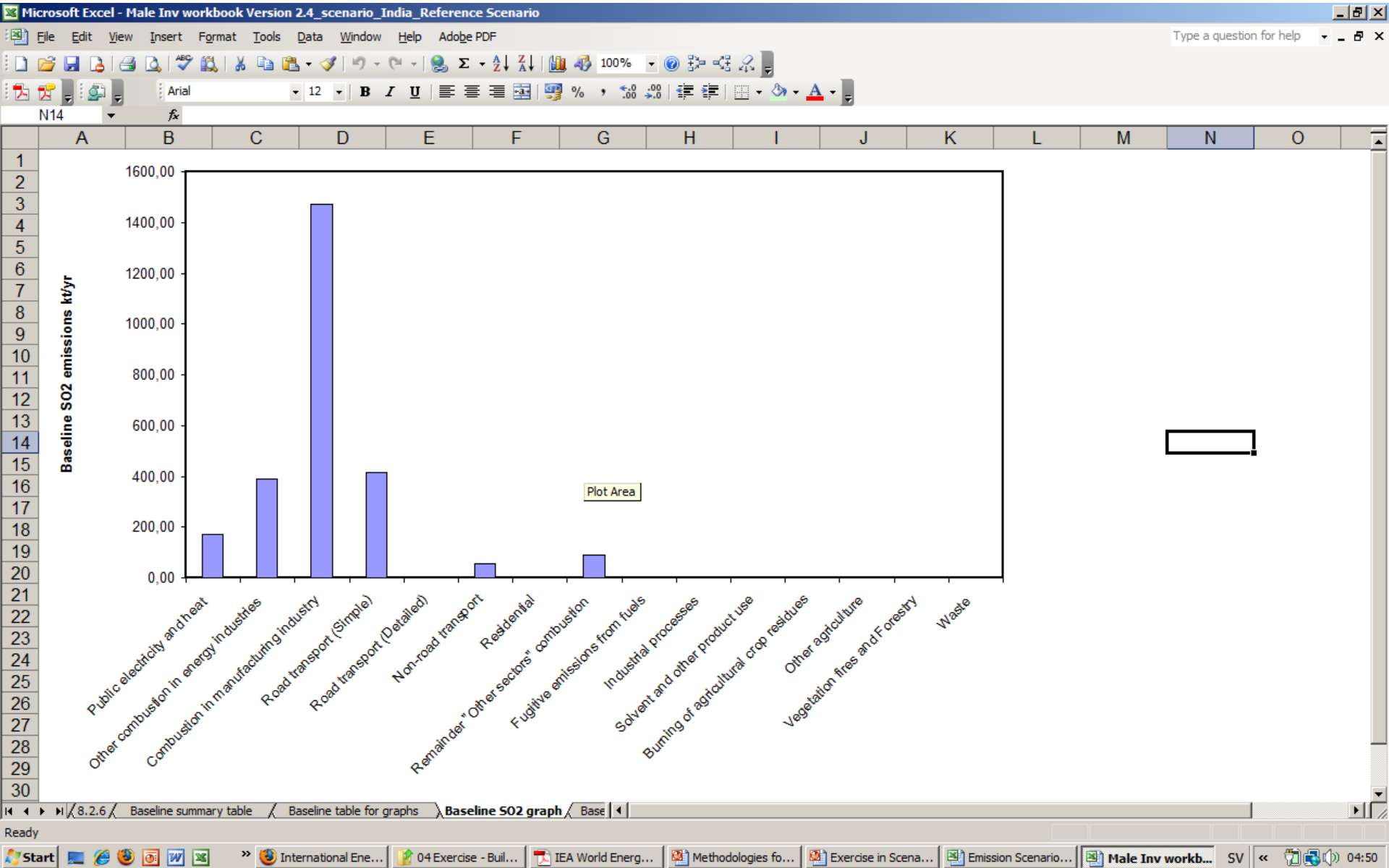
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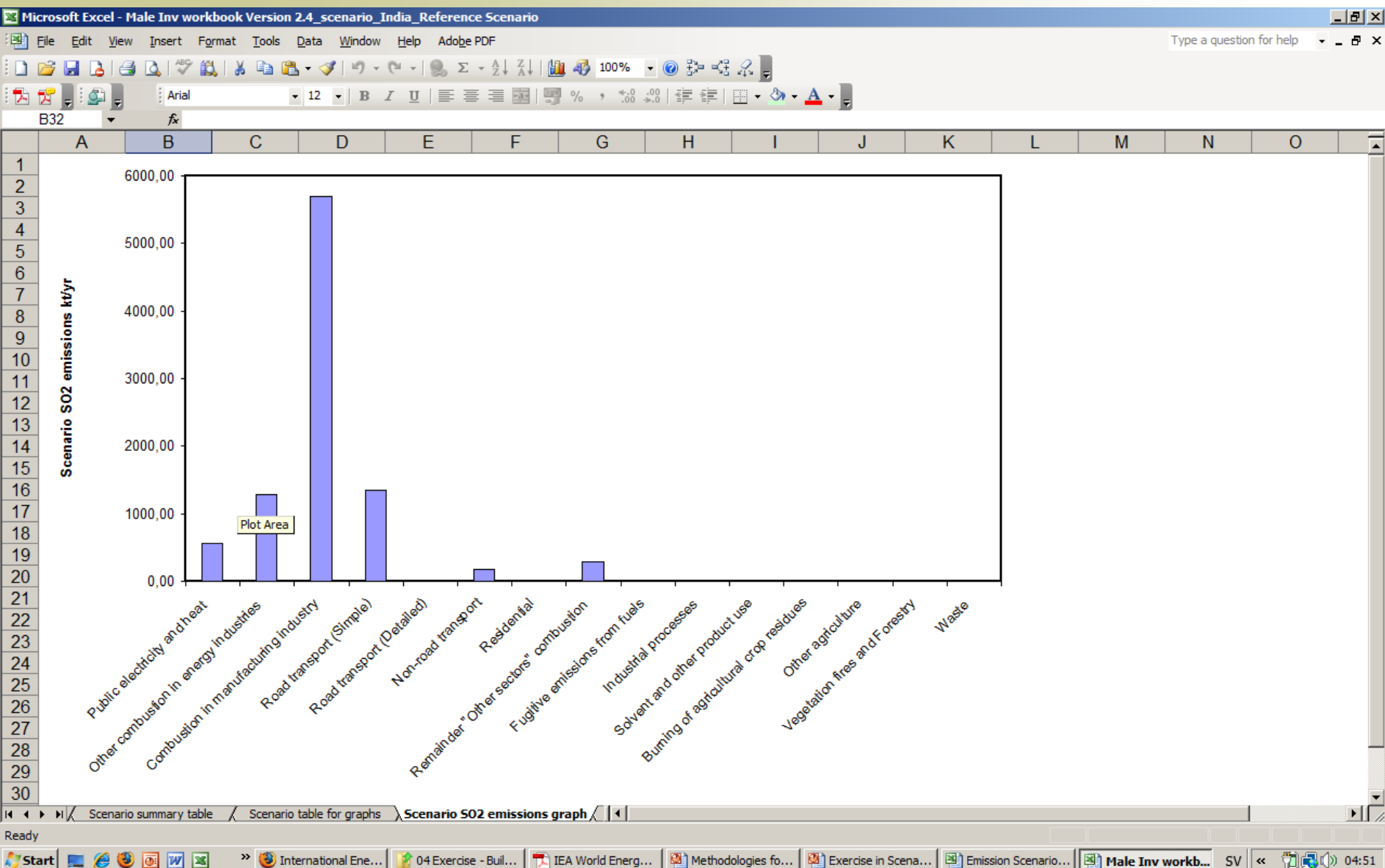
Overview of Scenarios in this exercise

	Reference Scenario 1	Alternative Policy Scenario	High Growth Scenario
Average GDP growth	6.5 % per year	6.5 % per year	8.5 % per year
Change in energy intensity	-2.5 % per year	-3.5 % per year	-4.5% per year
GDP in 2030 (2000=100)	661	661	1156
Total primary energy supply (2030)	324	243	432

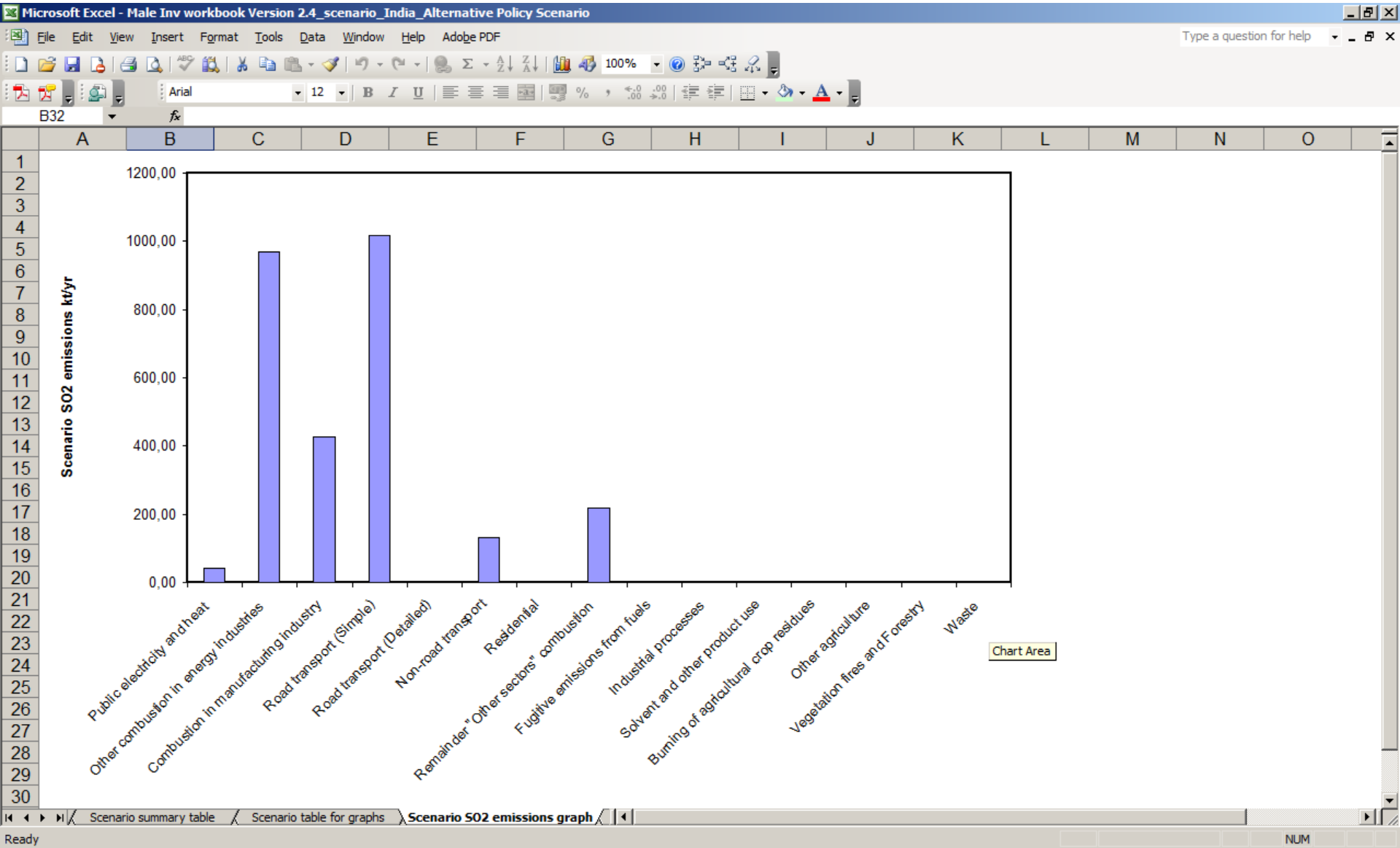
Outcomes: Base year (2030)



Outcomes: Reference Scenario (2030)



Outcomes: Alternative Policy Scenario (2030)



Discussion

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