Working Together:
Saving Tomorrow Today

Developing South Africa's baseline & mitigation scenarios – The LTMS & beyond

Mitigation & MRV Workshop – Hanoi, Vietnam

Climate Action Now!
Save the future

Why such a study?

- To assess the mitigation potential & opportunities for South Africa
- To inform South Africa's policy on climate change (baseline, mitigation, etc.)
- Government initiated the "**Long-Term Mitigation Scenarios**" (**LTMS**) process – carried out over 2 years
- LTMS study outcomes officially accepted by Cabinet

The Process

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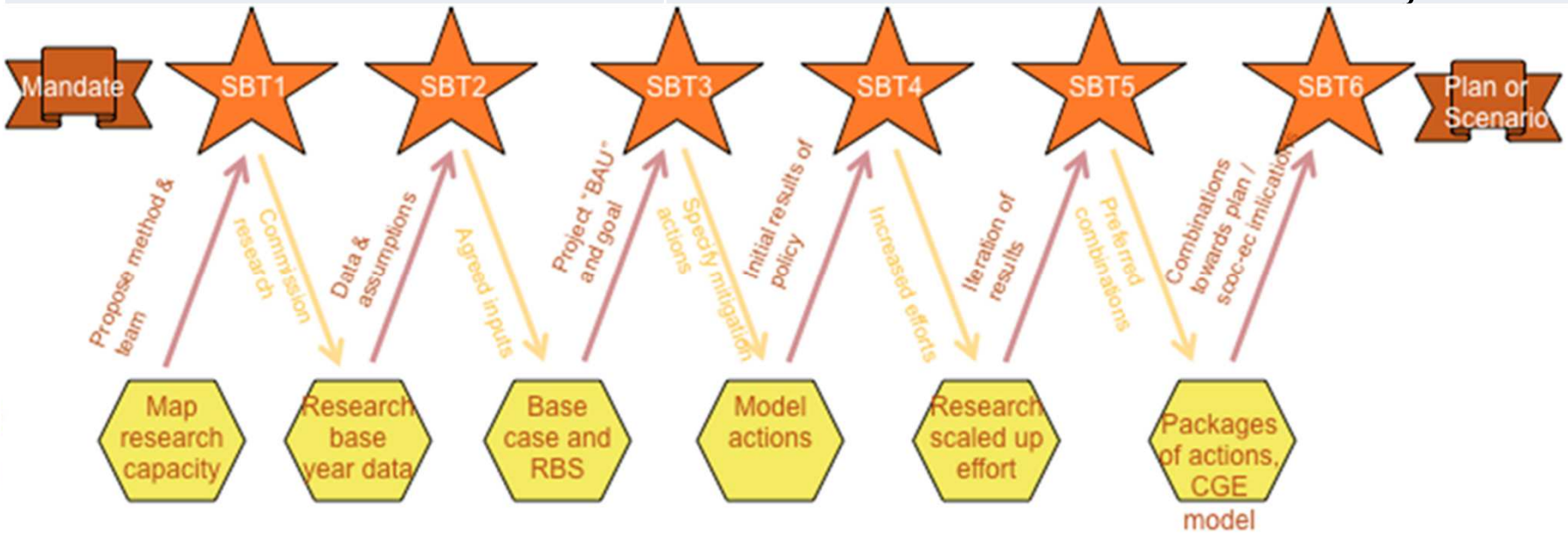
Coordination [ERC, University of Cape Town]

Scientific Research	Stakeholder Engagement
Four research teams: 1. Energy 2. NEE 3. Economy-wide modeling 4. Vulnerability, Impacts & adaptation	***Scenario Building Team (SBT):*** *Drove technical work & developed scenarios with research teams:* • Selected as individual leaders and strategic thinkers in particular sectors, with high level of technical skill • Sourced from 4 sectors in society:



Technical Approach

SECTOR	APPROACH
Energy (Power, transport, etc.)	**Markal** model
Non-Energy (IPPU, Waste, etc.)	Excel spreadsheet model
Economy-wide	CGE model

MARKAL VS. MESSAGE VS. LEAP

General	**MARKAL/TIMES is able to optimize (in terms of minimized system cost) both demand and supply side of the economy. I.e. Different supply-side and end-use technologies can compete and only optimum ones are chosen by the model, subject to user-defined constraints.**
Compared to MESSAGE	• MESSAGE does not allow easy **entry of data from excel spreadsheets** straight into the model. • The free solver that comes with MESSAGE **takes long** to run model databases with a large number of technologies and constraints
Compared to LEAP	• LEAP takes a **simulation approach**, and does not optimize for least-cost or any other criterion. Therefore LEAP does not allow the development of a large number of internally consistent scenarios as easily and as rapidly as optimization models. • In LEAP, one works from intensity back to the energy balance. There is no easy way of starting with the energy balance to get the intensity, making it **difficult to calibrate the energy balance**.

Primary Scenarios

1. **Growth Without Constraints**: Outlines the country's emissions if energy plans continued to be based purely on least-cost, without any constraints on growth, including carbon constraints.
2. **Required by Science**: asks what would happen if South Africa reduced emissions by the same percentage that is needed globally, acknowledging that countries have different capability and national circumstances (i.e. SA's fair-share of mitigation requirement)

Mitigation Scenarios

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- Compile a list of all realistic mitigation actions

Mitigation action	Model description and parameters
Escalating CO_2 tax	An escalating CO_2 tax is imposed on all energy-related CO_2 emissions, including process emissions from Sasol plants.
Nuclear and renewable electricity, extended	Combines the extended renewables and nuclear scenarios below. At 50% each, this is a zero-carbon electricity case
Electric vehicles with nuclear, renewables	Electric vehicles are allowed to take up 10% of passenger kilometre demand between 2008 and 2015 increasing to 60% of demand in 2030 and remains at 60% to 2050
Nuclear and renewables	Combines the individual nuclear and renewables cases. i.e. no electricity from fossil fuels by 2050
Industrial efficiency	Improved boiler efficiency, HVAC, refrigeration, water heating, lighting & air compressors, motors, compressed air management, building shell design optimising process control, energy management systems & introducing variable-speed drives
Renewables with learning, extended	Same as renewables extended (50%), but assuming that the unit costs of renewable energy technologies decline, as global installed capacity increases
Subsidy for renewables	-106 R/GJ, on electricity from power tower, trough, PV, wind, hydro, bagasse, LFG
Nuclear, extended	The bound on investment in new capacity for both PBMR and PWR were increased to 2050
Renewable electricity, extended	In an extended mitigation action, the bound on commissioning of new parabolic trough and solar power tower plant is increased to 2.5GW/year by 2050
Renewables with learning	Same as renewables (27%), but assuming that the unit costs of renewable energy technologies decline, as global installed capacity increases
Renewable energy for electricity generation	15% of electricity dispatched from domestic renewable resources by 2020, and 27% by 2030, from local hydro, wind, solar thermal, landfill gas, PV, bagasse / pulp & paper.
Nuclear electricity	27% of electricity dispatched by 2030 is from nuclear, either PBMRs or conventional nuclear PWRs – model optimised for cost etc.
Synfuels CCS 23 Mt	Carbon capture and storage on coal-to-liquid plant, with maximum storage of 23 Mt CO_2 per year, equivalent to concentrated emissions of existing plant
Improved vehicle efficiency	Improve energy efficiency of private cars and light commercial vehicles by 0.9%-1.2% per year (0.5% in base case).
Biofuel subsidy	A subsidy of R1.06 per litre on biofuels applied as an incentive for biofuel take-up
Passenger modal shift	Passengers shift from private car to public transport and from domestic air to intercity rail/bus.–moving from 51.8% of passenger kms in 2003 to 75% by 2050
Land use: fire control and savannah thickening	50% reduction in fire episodes in savannah from 2004
Electric vehicles in GWC grid	Electric up to 60% of the private passenger car market, operating in an unchanged grid, i.e. largely coal-fired
CCS on power stations, 20 Mt	A cap on CCS use is increased annually starting with 1 Mt in 2015, and reaching a peak of 20 Mt in 2024.
Waste management	Waste Minimisation and composting
Residential efficiency	Penetration of SWHs, passive solar design, efficient lighting, appliance labelling & STDs, geyser insulation, LPG for cooking, 'Basa Njengo Magogo' coal fire-lighting method

Mitigation Scenarios

- Packaging the mitigation actions into scenarios

1. **"Start Now"**: All mitigation actions that have upfront costs, but where the savings over time more than outweigh the initial costs – also known as net-negative cost mitigation actions – are part of this strategic option
2. **"Scale Up":** it is an extension of the *Start Now* package. Basically all the extendable mitigation actions in *Start now* are replaced in *Scale up* by their extended counterparts
3. **"Use the Market"**: focuses on the use of economic instruments, and it includes an escalating CO_2 tax on the whole energy sector, which generates revenue that could be used to provide incentives for renewable electricity, solar water heating and biofuels

The Full Picture

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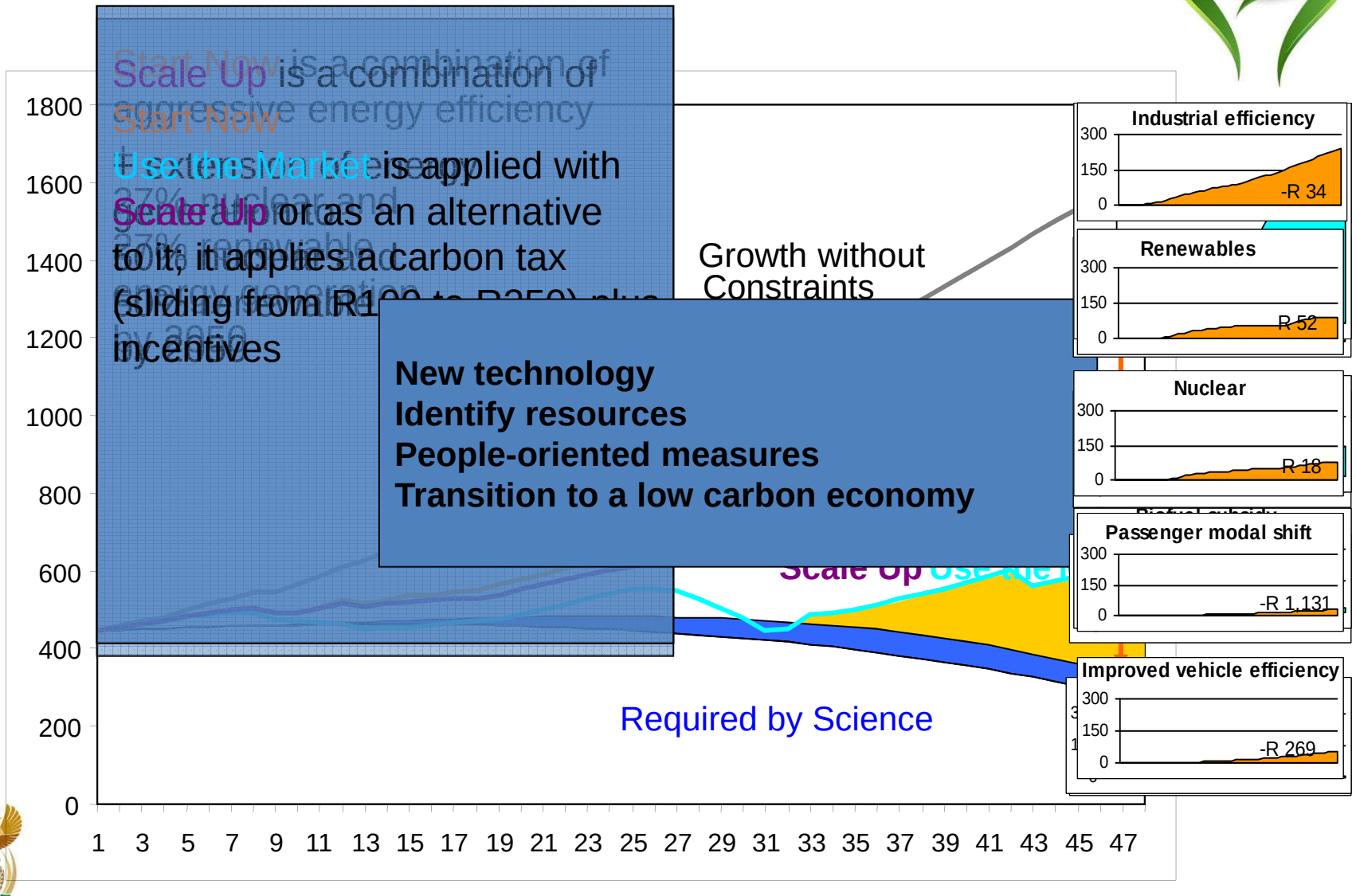
Scale Up is a combination of Start Now
Use the Market is applied with Scale Up or as an alternative to it; it applies a carbon tax (sliding from R1[illegible] to R350) plus incentives

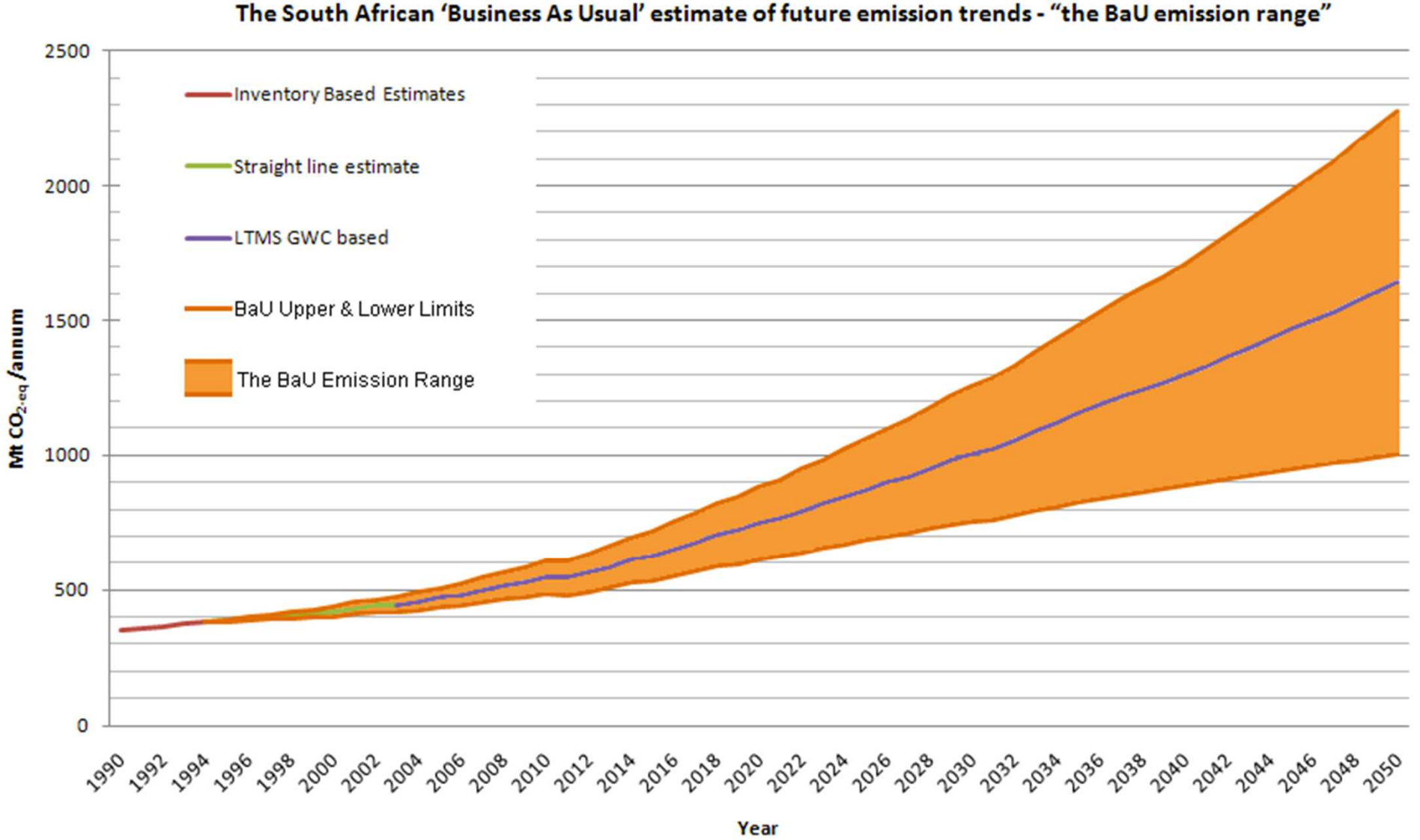
New technology
Identify resources
People-oriented measures
Transition to a low carbon economy



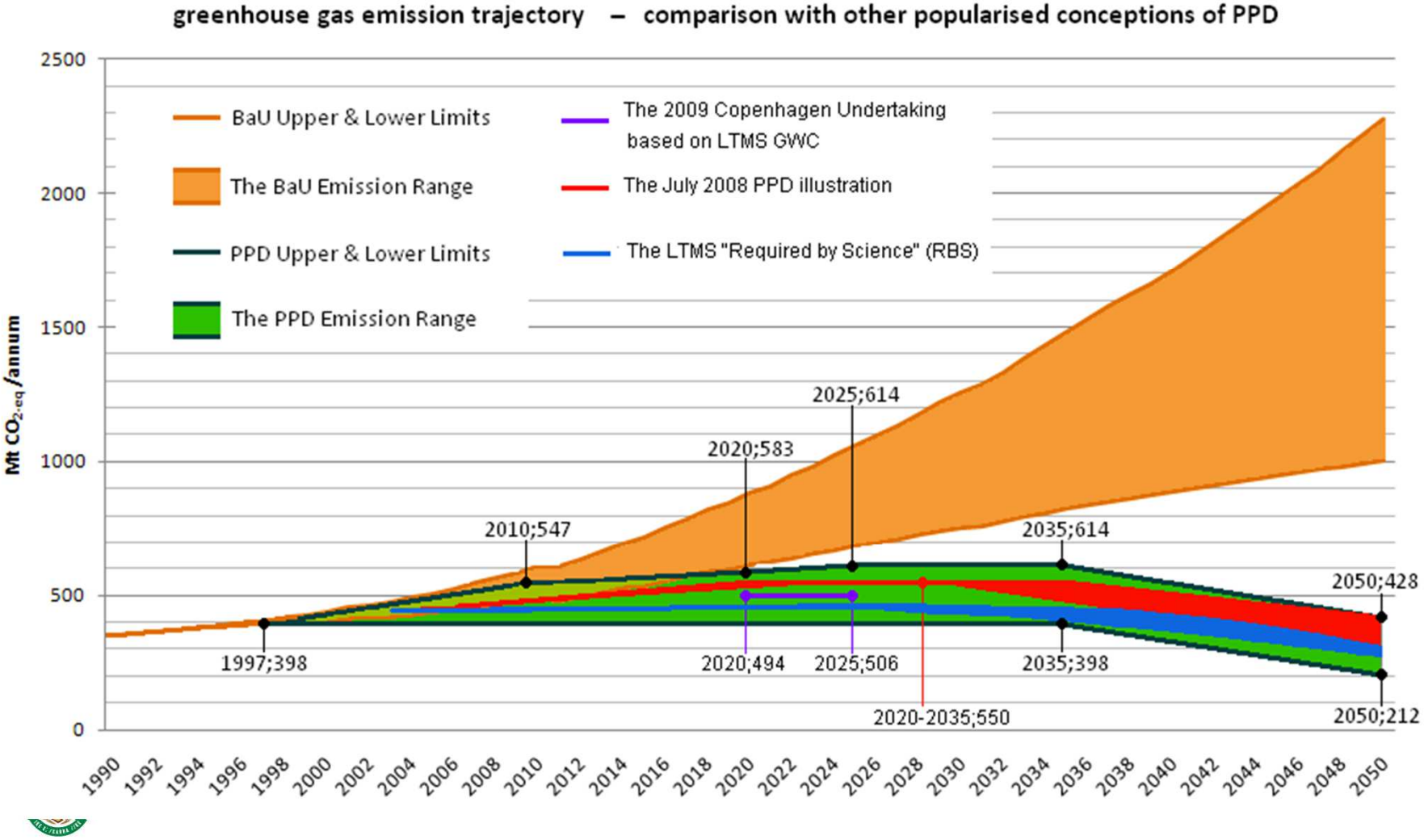
And then What?

- Results informed the development of the National Climate Change Response Policy
- Objective: Long-term just transition to a climate-resilient and lower-carbon economy and society
- Gives a guiding approach towards achieving the mitigation outlined in the LTMS process:
  - Setting the country's emissions baseline
  - Identifying desired sectorial mitigation contributions (DEROs)
  - Defining carbon budgets
  - Mitigation plans
  - mix of measures

The Country's Baseline as adopted in the National Climate Change Response Policy



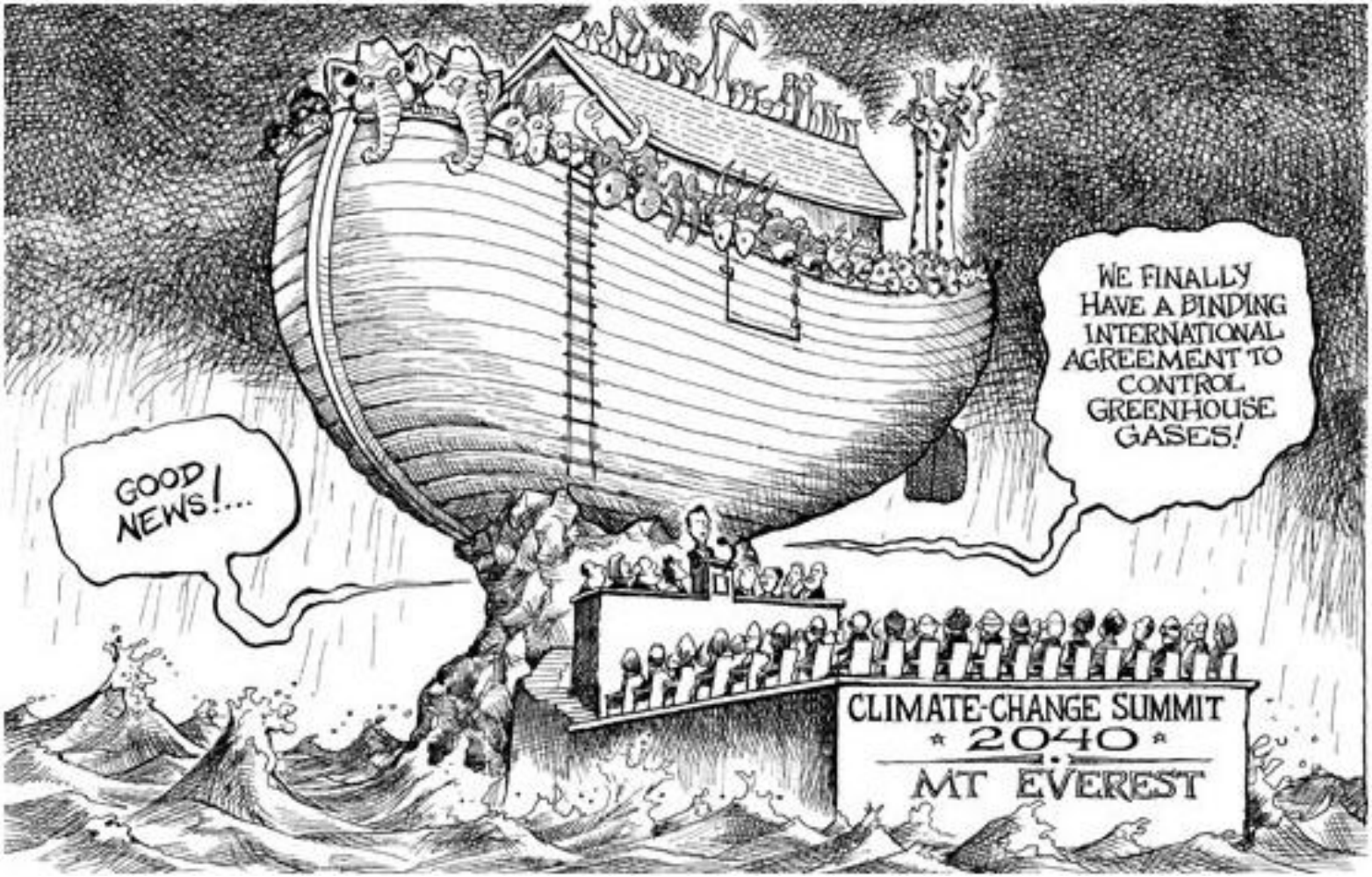
Baseline & Target in the Policy



Latest Developments

- DEROs process (agreed sectorial baselines for mitigation plans, updated mitigation actions, etc.)
  - Using information from the country's latest Integrated Resource Plan
  - Updating costs in light of the global economic meltdown
  - Detailed sector & sub-sector –level socio-economic analyses

Thank You!



Cartoon by Kal (Economist)

KEY DRIVERS

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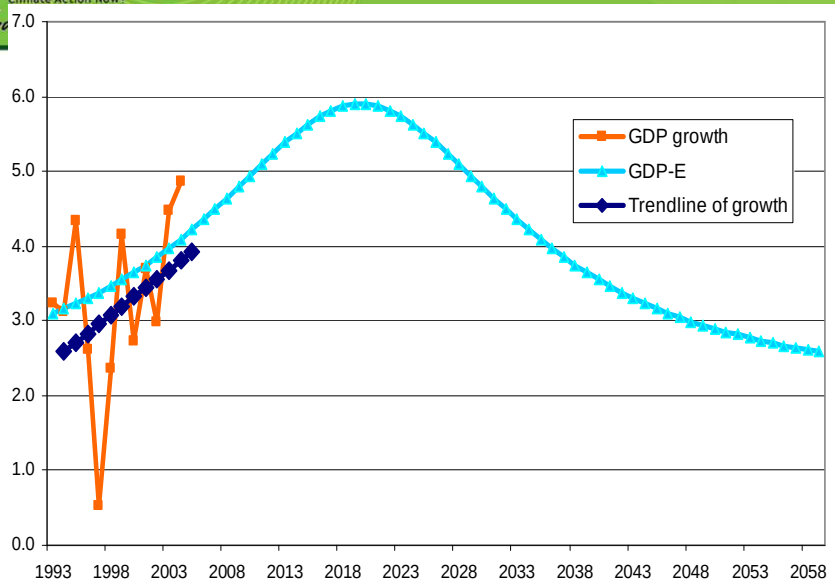

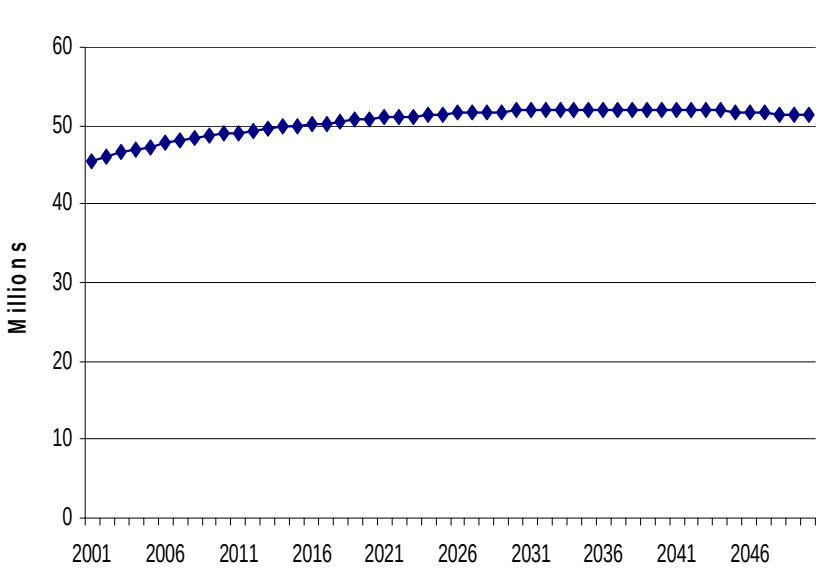

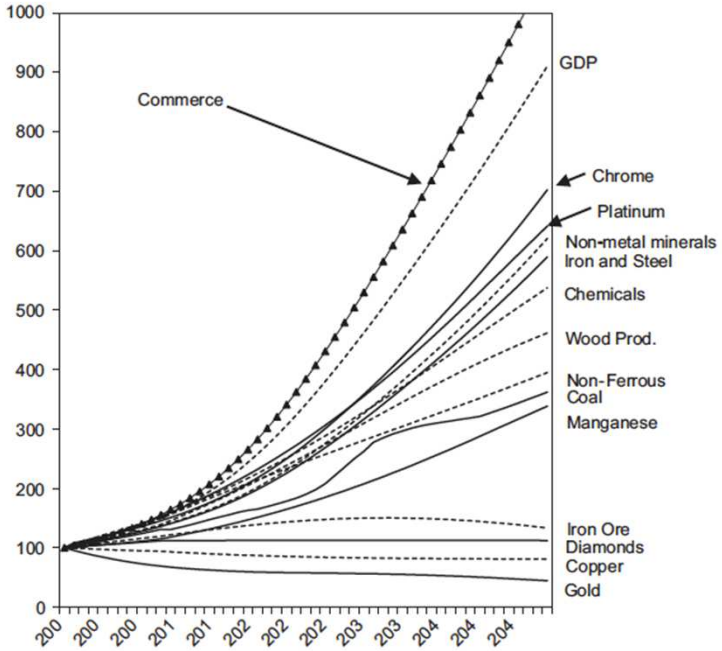

Other drivers:

- Discount rates
- Exchange rates
- Technology learning
- Future energy prices