

WORLD ENERGY OUTLOOK SCENARIOS OF THE INTERNATIONAL ENERGY AGENCY

INTERNATIONAL ENERGY AGENCY (IEA)

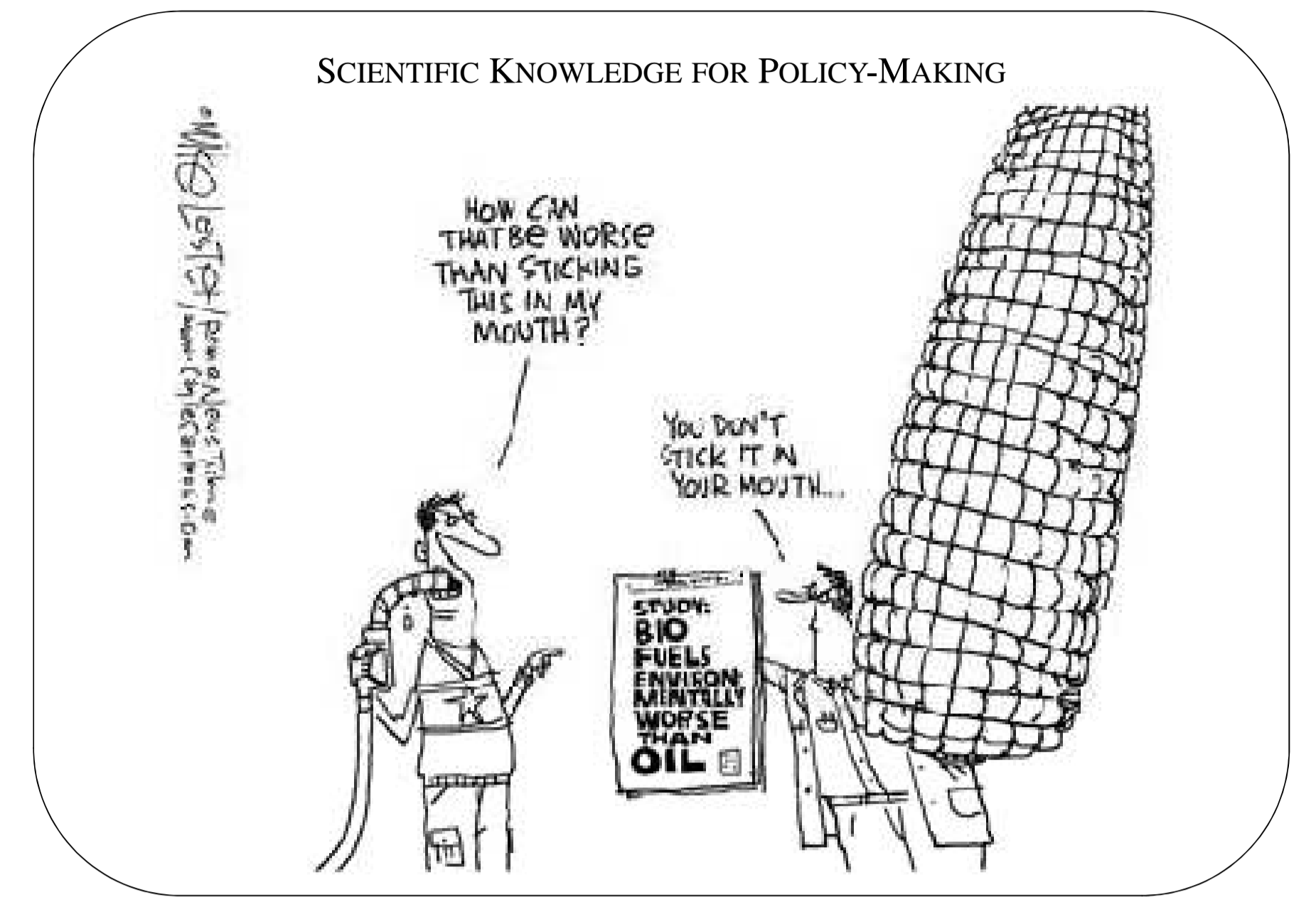
Founded in 1974 as autonomous body in OECD framework



STRUCTURE: Governing Board of member states' energy ministers; Secretariat of energy experts headed by Executive Director

SHARED GOALS OF IEA MEMBER STATES: (1) diversity, efficiency and flexibility within the energy sector; (2) prompt and flexible responses to energy emergencies; (3) environmentally sustainable provision and use of energy; (4) more environmentally acceptable energy sources; (5) improved energy efficiency; (6) research, development and market deployment of new and improved energy technologies; (7) undistorted energy prices; (8) free and open trade; (9) co-operation among all energy market participants

Availability of and access to raw materials have since time immemorial influenced how men relate to each other and how they progress through history. Energy policy epitomises the fundamental resource conflict in the face of scarcity reflected in fierce economic competition and power politics. Domestically as well as globally, politics in this domain remains a highly sensitive endeavour. Additionally, the globalisation of economic and financial relations, politics and culture as well as problems and risks has given rise to an increased interdependency of countries regarding their possibilities to act. This can also be observed in regard to the means by which knowledge is made available for governance processes. Information has always been an essential requirement for the exercise of political power manifesting for instance in population censuses, the creation of land-registries and statistical offices. Next to the collection of present facts, the anticipation of future developments has been equally important and addressed for example by insurance systems and economic planning boards. In line with an increasing specialisation and division of labour, "expert" bodies have been developed to collect data, produce knowledge and place it at the disposal of politics. In addition to science and government agencies, progressively also private institutions, such as think tanks, and intergovernmental bodies provide decision-makers with policy advice. The International Energy Agency (IEA) is an example of these developments for the domain of energy policy. The IEA is a governmental international organisation in the framework of the Organisation for Economic Co-operation and Development (OECD). Its mandate includes the coordination of measures to cope with oil supply disruptions and the provision of energy policy advice. This poster takes a closer look at the second function and examines the IEA as an actor supplying knowledge and information for governance processes by elaborating energy scenarios.



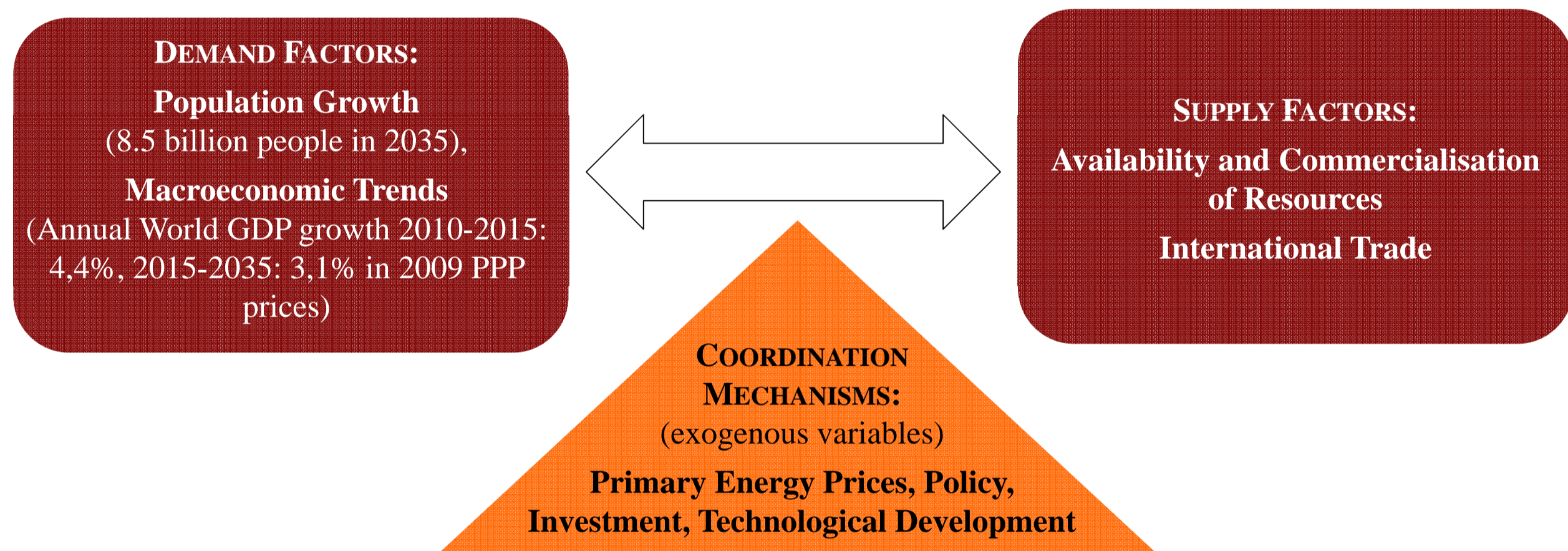
WORLD ENERGY OUTLOOK 2010

Energy scenarios presented in the annual World Energy Outlook (WEO) are one of the IEA's most important instruments to inform governments about current developments of energy markets and future trends. They rely on the analysis of data gathered from governments, international organisations as well as from the private sector, and its extrapolation until 2035. The methodology behind the elaboration of energy scenarios consists in the choice of assumptions regarding a reference system and its development along with their quantification through numerical modelling and computer simulation. The World Energy Outlook 2010 draws conclusions for policy advice based on three reference scenarios: Current Policies, New Policies, 450 Scenario.

CURRENT POLICIES SCENARIO	Baseline scenario taking into account policies adopted and implemented until mid-2010
NEW POLICIES SCENARIO	Current Policy Scenario plus announced political commitments until 2020, e.g. Copenhagen Accord, Emission Trading Schemes in EU and OECD, phase-out of fossil-fuel consumption subsidies, prolongation of nuclear plant lifetime and additional measures from 2020 to 2035
450 SCENARIO	New Policies Scenario plus more rigid compliance and implementation of farther-reaching policy goals in order to achieve the aim of limiting global warming to 2° C and atmospheric greenhouse gas concentration to 450 part per million of carbon dioxide equivalent

SHARED BASIC ASSUMPTIONS

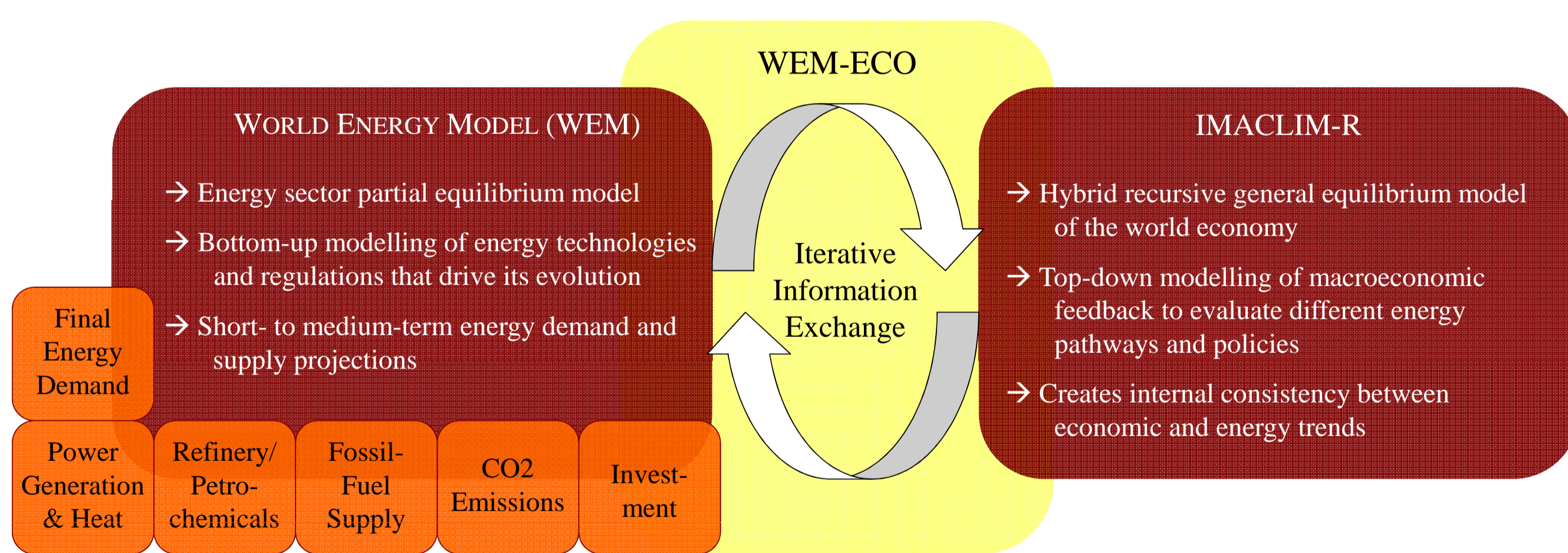
Market-based: energy scenarios are produced by modelling the interaction between energy demands and supply



→ Governance as primary driving factor for change, as policies are assumed to influence prices and technological development

QUANTIFICATION

The IEA's energy scenarios are modelled and simulated by the coupled WEM-ECO model which combines the World Energy Model, an energy sector bottom-up model, with IMACLIM-R, a top-down macro-economic equilibrium model. Based on input data primarily covering the period from 1971 to 2008 predictions are made in one-year-steps until 2035. The geographical resolution of model outputs specifies predictions for 24 regions ranging from single countries, such as Japan or Mexico, to larger aggregates, e.g. the Middle East and Sub-Saharan Africa.



SUMMARY OF PROJECTED DEVELOPMENTS

The WEO 2010 projects a rise in global primary energy demand from 2008 to 2035 of 36% (New Policies Scenario), 44% (Current Policies Scenario) and 25% (450 Scenario). China, US and India being the top three energy consumers in 2035, 93% of the projected increase in demand stem from non-OECD countries. The 2035 global energy mix based on the New Policies Scenario presents oil as dominant fuel with a 28% share (33% in 2008), nuclear energy with 8% (6% in 2008) and renewables with 14% (7% in 2008). Power generation (heat and electricity) accounts for the biggest share (53%) in the primary energy demand increase. Final energy is projected to be consumed at 33% by the building sector, 30% by industry and 27% by transport. Oil remains dominant among the fossil fuel used which entails an increase in the crude oil price from \$60 per barrel (2009) to \$113 (2035, in 2009 dollar values) and a 44% increase in demand of natural gas. The production of natural gas liquids and unconventional oil is assumed to grow significantly. Political commitments considered in the Current Policy Scenario are judged insufficient for reaching Copenhagen Accord goals. They would lead to a stabilisation of greenhouse gas emissions at 650 ppm CO₂-eq. and a corresponding temperature increase above 3,5 % in the longer term. Considering more ambitious policies, the New Policies Scenario (intensified action after 2020) is more expensive in terms of required investment than the 450 Scenario (immediate action). No scenario under consideration (based on implemented or announced policies) projects a substantial reduction of energy poverty, primarily concentrated in rural areas of Sub-Saharan Africa, India and Asian developing countries.

GOVERNING BY SCENARIOS

GOVERNANCE

The concept of "governance" has its origin in political science debates on the role of the nation state at the end of the 20th century and has been majorly inspired by European integration. Governance may be understood as „the continuous political process of setting explicit goals for society and intervening in it in order to achieve these goals“ (Jachtenfuchs/Kohler-Koch 2004: 99). The reference to governance, instead of government, emphasises that political power is no longer concentrated on the national level of decision-making, but dispersed on various levels – local, European and global – as well as that a variety of private actors participate in the development and implementation of regulation (cf. Marks/Hooghe 2001). An important dimension of governance is the "outsourcing" of information gathering and the provision of knowledge for political decision-making to external actors, such as think tanks, science and experts (e.g. Schuppert/Voßkuhle 2008). This allows specialised bodies to address intensified information requirements, but simultaneously creates the necessity for the state to appropriate these cognitive resources, e.g. by obtaining scientific or commercial policy advice.

Based on the basic values of what the IEA calls "sound energy policy-making" – environmental sensitivity, energy security, economic development – WEO energy scenarios explore possible goals and means of intervention. For this purpose they present three images of the world in 2035. A baseline outlook scenario (Current Policies) is contrasted with an intervention scenario (New Policies) and the exploratory forecasting of the latter is compared to a third, backcast-intervention scenario (450 Scenario).

SCENARIOS

Scenario analysis, formed into a research tradition by economics, are commonly understood as "images of the future" or internally coherent abstractions of possible future developments of a reference system under defined conditions (cf. Armatte 2010). They "explore" uncertainty by asking and answering "if ... then" questions to support risk management decisions" (Hamrin/Hummel/Canapa 2007: 8). Generally, scenarios consist of a narrative storyline and its translation into computer simulated numerical models. In their function as instruments of knowledge generation, scenarios rely on the representation of a system of reference, derived from data, theory and additional assumptions, in both a qualitative and a quantitative format as well as the computational manipulation of the latter (cf. Morgan/Morrison 1999; Humphreys 2004). Conventions, e.g. regarding the choice of reference systems, input variables or boundary conditions as well as the standardisation of methods and definitions, play a central role for the use of scenarios as analytical tools. This is also true for uncertainties concerning the projected outputs and their evaluation against "reality" (Armatte 2010; Armatte/Dahan 2004).

HOW DO SCENARIOS QUALIFY AS TOOLS FOR GOVERNANCE?

Demand orientation

- Combination of long-term scenario perspective and short-term, year-by-year, predictions
- Regional/country as well as sector-by-sector resolution of output data

Pragmatic orientation towards action, instead of cognitive one towards understanding

- Policy as primary trigger for change in possible futures
- Central variables in computer simulations, e.g. energy prices or supply quantities, are simultaneously focuses of exchange between engineers, economists and decision-makers as well as starting points for political interventions

Operationalist orientation towards models that work, i.e. predict, instead of explaining

- Abstraction, simplification and computability given priority over "realistic" model
- Integration of expert judgement for initial and boundary conditions

WHICH DIFFICULTIES ARISE, IF SCIENTIFIC METHODS ARE USED EXTERNAL TO THE SCIENTIFIC COMMUNITY FOR POLICY ADVICE?

Legitimacy of knowledge claims

- Possible conflict of interests as policy is the main driving factor of change in scenarios, while governments are major suppliers of input data and scenario users; private sector involvement
- Private knowledge, no peer-review of methods and results

Credibility of methods and results

- Computational constraints restrict the representational capacity of models and thus their relation to real-world phenomena
- Incomplete theoretical accounts and short sets of historical data
- Approval of model outputs through comparison with other models, impossibility of empirical testing against future data

Transparency of sources, procedures and implications

- Absence of specifications about the deliberation process and values involved in the choice of scenario assumptions
- Uncertainty only mentioned concerning political action, prices and other "real-life" phenomena, but no specification of the precision of scenarios as instruments and accuracy of results, apart from the general assertion that scenarios are not forecasts

MERITS AND DRAWBACKS OF IEA SCENARIOS AS BASIS FOR POLITICAL ACTION

- (+) Orientation for policy-making in contexts of uncertainty
- (+) Assembly and application of available knowledge and information in order to address real-life problems
- (+) Critical assessment of government policies through confrontation of announced policy goals and intended means (450 Scenario)
- (-) Pretension of causality by contrasting Current and Future Policy Scenarios, and of exact (quantitative) assessment
- (-) Absence of open review of methodology
- (-) Suspicion of bias in favour of OECD interests and ideologies, overstatement of steering-capacities of governments

CONCLUSION

The use of a scenario approach as analytical tool in order to confront the complexity and uncertainty of future energy markets may provide a useful orientation for policy-makers through its focus on governability. However, precisely this focus has the potential to compromise the soundness of seemingly scientific, "objective" methods which is why a cautious handling of projections is crucial. As, moreover, policy advice is available from a variety of sources comparative research could help exploring their reliability and effectiveness. For instance, the Intergovernmental Panel on Climate Change (IPCC) is another prominent actor supplying knowledge and information for governance processes. To some extent it faces comparable methodological issues and political influences like the IEA. In contrast, the IPCC practices a much more open and cautious treatment of uncertainties, however it makes farther-reaching claims regarding its projections (e.g. a probabilisation of models which judges the likelihood of possible futures). Thus, the study of different institutional settings, policy fields and the interests at stake as well as the contexts of knowledge generation (personnel involved, time frame of published reports, financing) promises further insights on the requirements and implications of cooperation between science, in a larger sense, and politics. It would further be interesting to examine the role of intergovernmental organisations for the provision of advice to international policy on a more general level. If one assumes that the methods and formats of knowledge used in political processes develop in accordance with the role and functions of the state (Desrosières 2008), the spread of international scientific advisory bodies using scenario approaches might indicate an increased importance of governance in global policy networks and a growing orientation towards risk management.