Integrated Resource Planning Training for Decision Makers

Day 7, Session 14 – Social, environmental, and climate change aspects

16 March 2021

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Agenda

- **Overview of social, environmental, and climate change aspects**
- **Where the aspects fit in to the IRP process**
- **Approaches to incorporating social, environmental, and climate change**
  - E/SIA of individual projects
  - Project comparisons
  - Scenario comparisons
  - Policy objectives / constraints
  - E/SIA of the IRP
- **Discussion questions**

Opening thoughts

- **Are social, environmental, and climate change aspects just an add-on?**
  - Or can they be incorporated into calculations?
- **Where do the directives come from?**
  - May not be energy policies
- **We know about EIA and SIA – how are they relevant?**
- **So much of what we've been saying so far is highly quantifiable and robust**
  - These aspects are more difficult to quantify

Recap: IRP is a powerful document which impacts on many stakeholders

- **The IRP has significant implications for various stakeholders**
  - Electricity sector actors (utility, IPPs, ITCs, IDCs)
  - Government agencies
  - Consumers
- **IRP also has impacts extending beyond the electricity sector**
  - Environmental impacts
  - Socio-economic impacts
  - Sectoral development
  - Macroeconomic impacts
- **Stakeholders have an interest in the development of the electricity sector**
- **Many new IRPs fail to recognise the importance of comprehensive stakeholder engagement**

Social, environmental, and climate change aspects

Overview of social, environmental, and climate change aspects

Where they fit in the IRP process
Approaches to incorporating social, environmental, and climate change
Discussion questions

Why social, environmental, and climate change aspects are important

LOOK BEFORE YOU LEAPFROG

Biden's crusade against fossil fuels won't work in Africa

Africa grapples with clean energy conundrum

By Serusha Govender
Johannesburg

25 February 2020

Tanzania's biggest wildlife reserve under threat

Despite major backlash from conservationists, the Tanzanian government plans to start building a hydropower dam inside a UNESCO-protected wildlife reserve this July. More than 2.6 million trees face the chop.

Why social, environmental, and climate change aspects are important

Jun 26, 2019, 02:40am EDT | 32,371 views

Why Wind Turbines Threaten Endangered Species With Extinction

South African Coal Plant Likely Killed by High Court

Ottawa

Minister Catherine McKenna asked to stop Enerdu hydro dam expansion in Almonte

Construction could destroy endangered dragonfly habitat, opponents of dam say

Why social, environmental, and climate change aspects are important

Part 1: Leaving fossil fuels in the ground: Who, how and when?

October 18, 2016 | Posted by James Morrissey

Coal being excavated at the Jim Bridger Mine outside Point of the Rocks, Wyoming. (Photo: Reuters / Jim Urquhart)

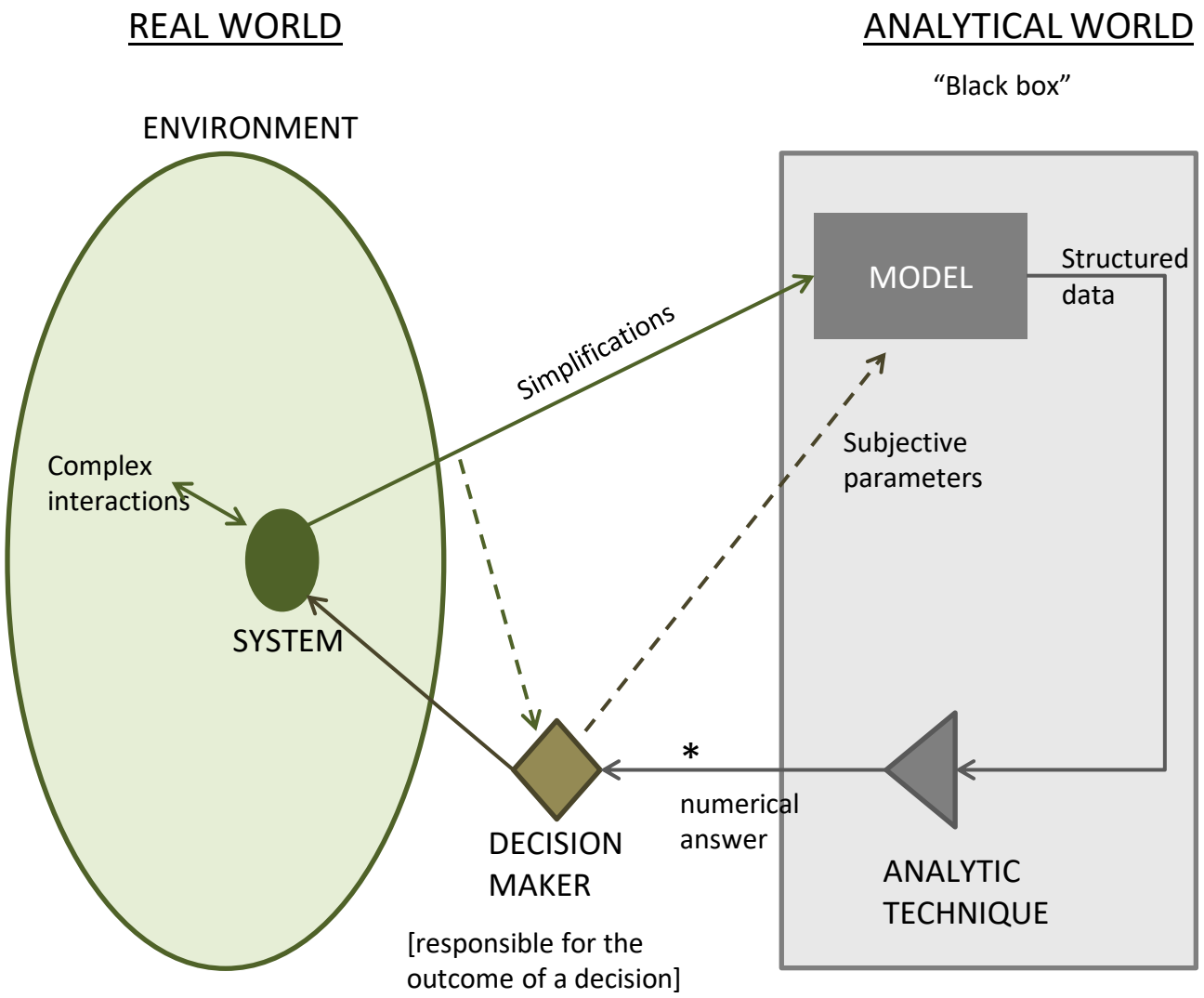
Are these aspects just an add-on to the technical and economic calculations?

Our overview showed that IRP is broader than a simple least-cost analysis

- A reminder of our definition:
  - ***Integrated Resource Planning [IRP]:*** is an approach to national power system development planning that incorporates a holistic assessment of available energy resources and opportunities for demand management into deriving a least-cost combination of supply and energy efficiency measures to meet long term requirements for electricity services during a specified period, while furthering broad national objectives such as social equity and environmental sustainability.

- The integrated approach of IRP has also led to the incorporation of ***broad electricity policy objectives and national development goals***
  - Study TOR highlighted in this context "evolving **renewable energy** and energy storage technologies, **energy efficiency**, distributed energy resources, **climate change impacts**, **goals for universal electricity access**, **climate change mitigation**, and the potential for private sector investments".

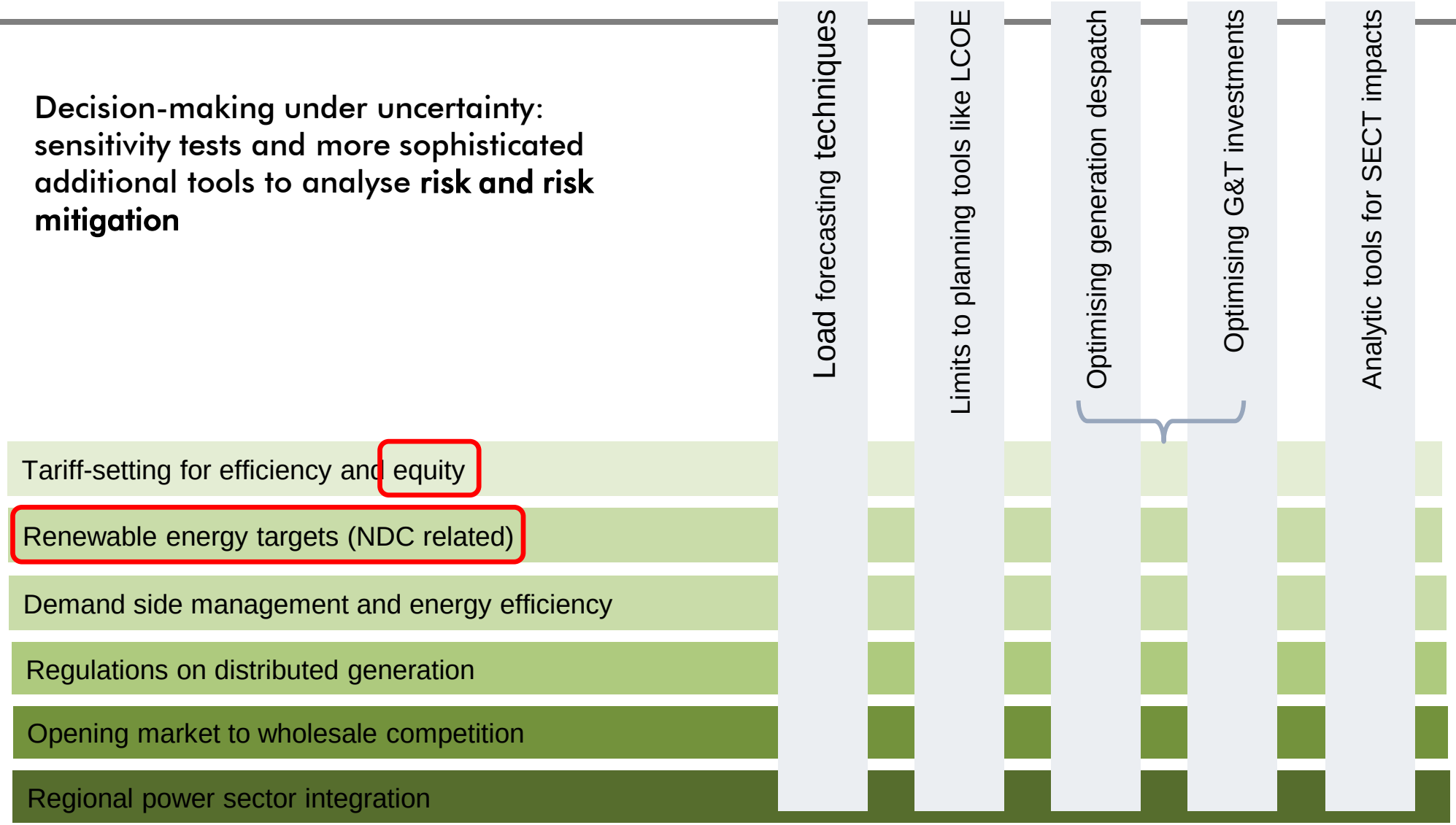
Social, environmental, and climate change aspects fit in to our model



Social, environmental, and climate change aspects are just as much a part of the IRP process as the data on and modelling of power stations, transmission networks, and demand forecasts

Policy and regulatory issues cross-cutting with the tools for IRP planning

Decision-making under uncertainty: sensitivity tests and more sophisticated additional tools to analyse **risk and risk mitigation**



SECT = social, environmental and climate change tools

What are some of the relevant issues?

- **Environmental issues**
  - Carbon emissions
  - Other emissions, eg, NOx, SOx, PM, Hg
  - Flooding of sensitive areas
  - Threats to flora and fauna
  - ‘Visual’ pollution
  - Others?

- **Social issues**
  - Displacement of populations for construction
  - Sensitive land
  - Direct jobs
  - Value chain jobs
  - Tariff increase impacts on growth
  - Others?

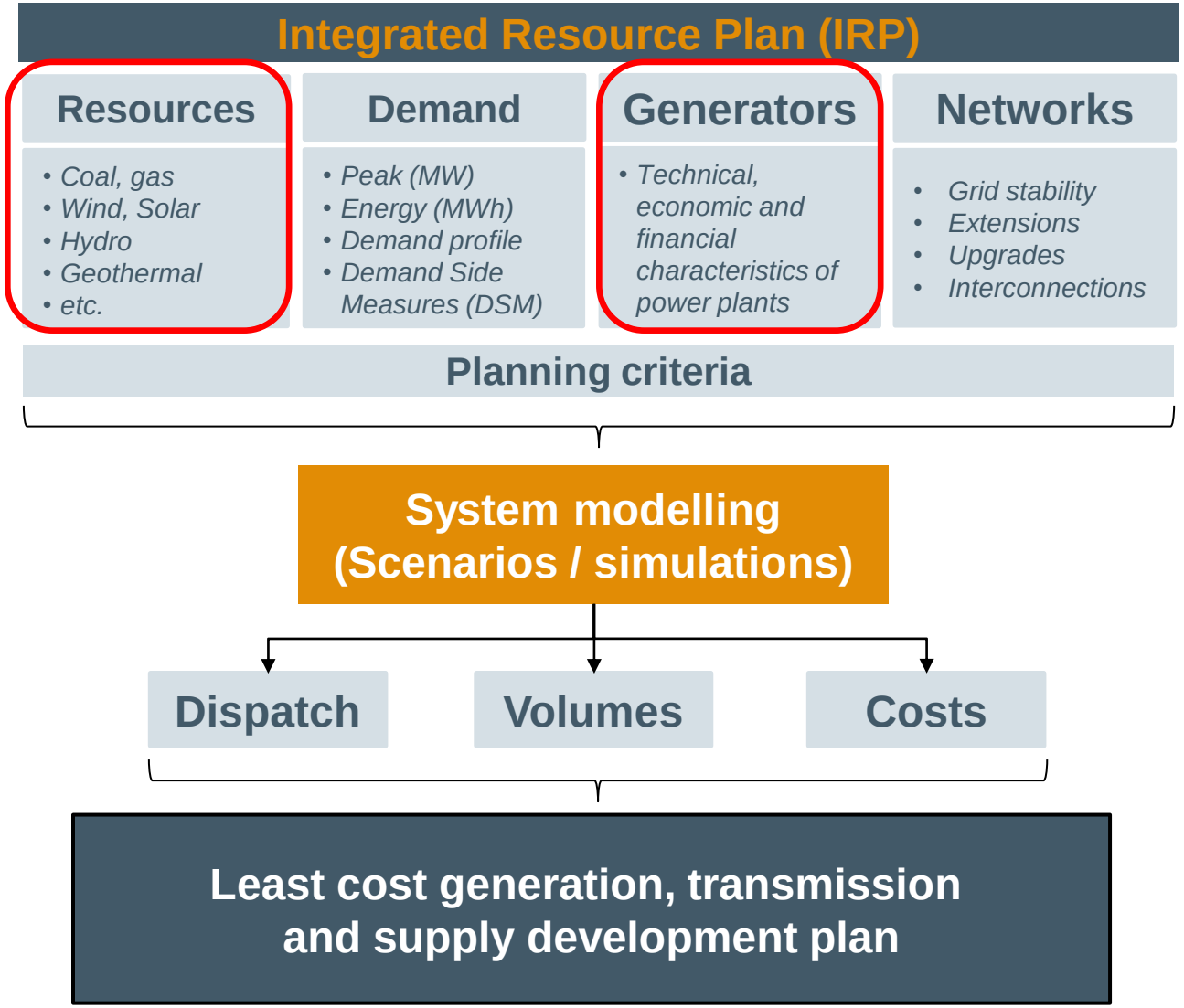
Social, environmental, and climate change aspects

Overview of social, environmental, and climate change aspects

Where the aspects fit into IRP planning

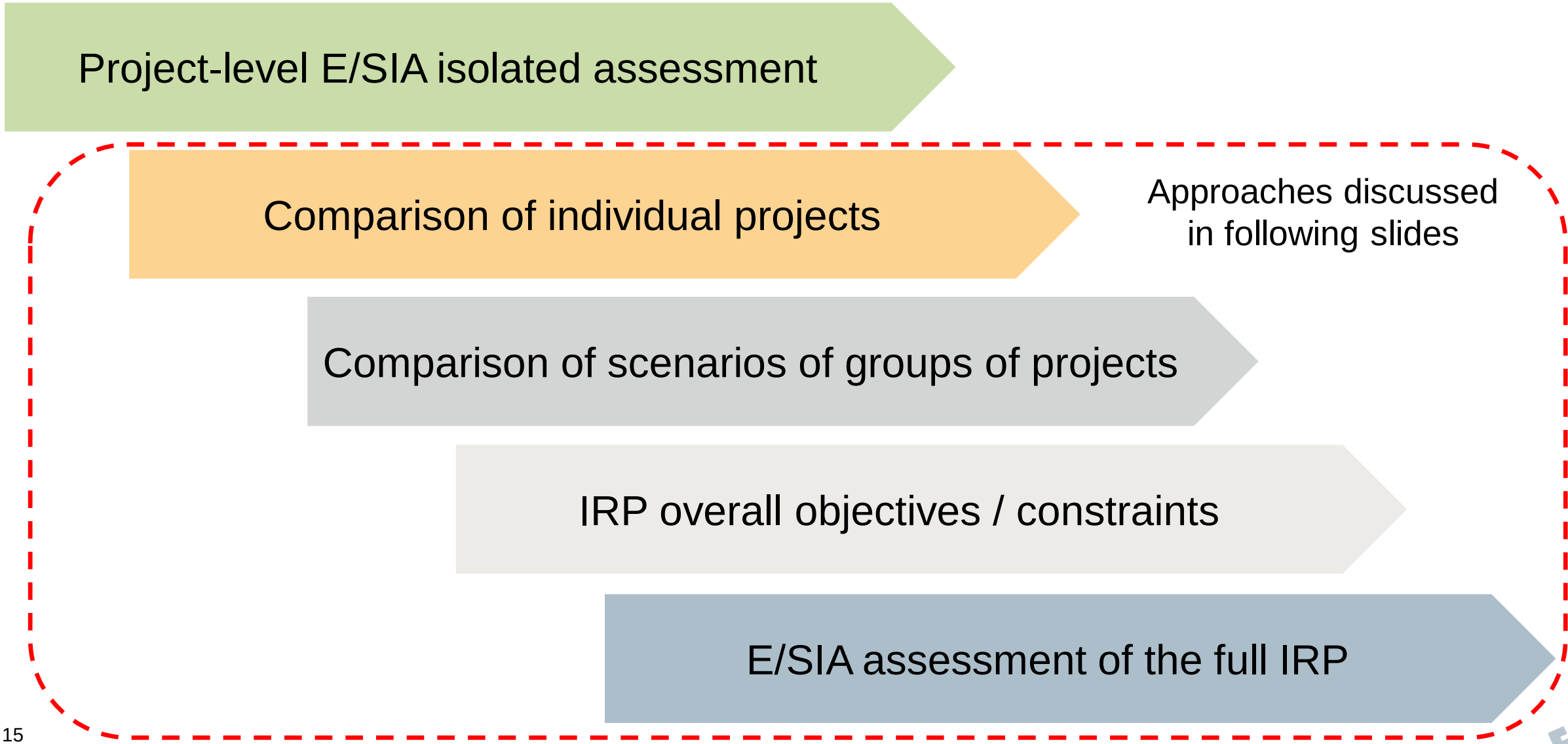
Approaches to incorporating social, environmental, and climate change
Discussion questions

Where do social and environmental issues get incorporated in an IRP process?



- **Key insights an IRP can provide:**
  - Generation and transmission plan under different market conditions including capital, fixed and variable operating costs
  - What capacity to contract and at what price for PPAs
  - Which are the best generation locations and where should the grid be reinforced
  - What could be the supply costs going forward
  - What could be the tariff going forward
  - Prove that an investment is necessary and legitimate to secure financing

Approaches to incorporating social and environmental issues



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Country examples – environmental aspects

Included in calculations	Targets or objectives, but not in calculations	Addressed in a separate document, eg, NDC
• **Angola**: CO_2 emissions • **Malawi**: standards, emissions, compensation in capex and opex • **Namibia**: air pollution in capex and opex; RE scenarios prioritised • **South Africa**: emissions included in calcs (three approaches)	• **Botswana** • **Mauritius** • **Seychelles** • **Zambia**	• **Eswatini** • **South Africa**

RE targets excluded from this summary

Country examples – social aspects

Included in calculations	Targets or objectives, but not in calculations	Addressed in a separate document
• **Malawi**: standards, popn displacement, compensation in capex and opex • **Namibia**: standards, popn displacement, compensation in capex and opex	• **Botswana** • **Comoros** • **Seychelles**	• **South Africa** • **Zambia**

Comparison of individual projects

- Each project entered for selection has its individual environmental and social aspects **priced on a consistent basis**:
  - Price of emissions
  - Costs of relocating people
  - Costs of environmental damage
  - Jobs created (direct and value chain)
  - Mitigation / compensation measures
- Cost and benefit prices should be based on robust assumptions and/or references
- Total project costs and benefits are then compared

Malawi incorporates environmental externalities

- **What are the environmental consequences of the options selected by PLEXOS?**
  - Social and environmental mitigation measures are assumed to be included in capital costs (including resettlement costs and compensation where appropriate)
  - The costs and benefits of other environmental and social externalities (CO_2, air quality, etc.) have not been quantified – hydro selected early in programme, issues relate more to coal later

Comparison of scenarios of groups of projects

- Planning options are grouped by scenario
- The environmental and social costs and benefits of each scenario are calculated **for the whole scenario**
- The scenarios can be compared based on these metrics

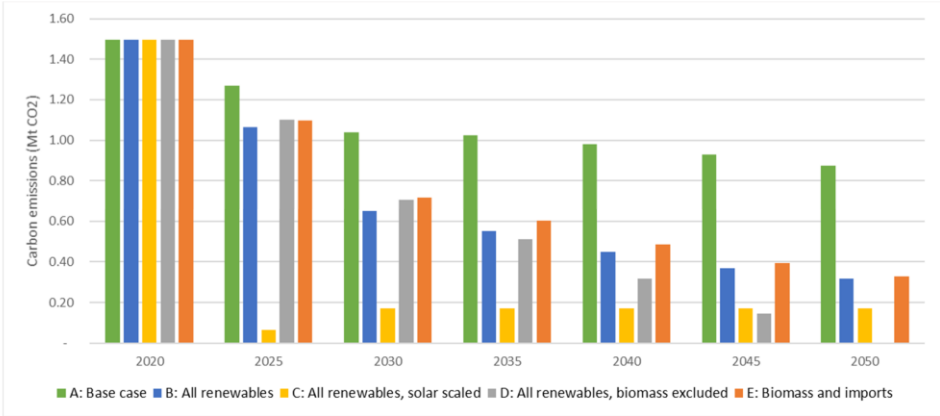


Figure 44: Annual carbon emissions for the Energy Efficient demand scenario and the five supply scenarios.

eThekwini IRP (South Africa)

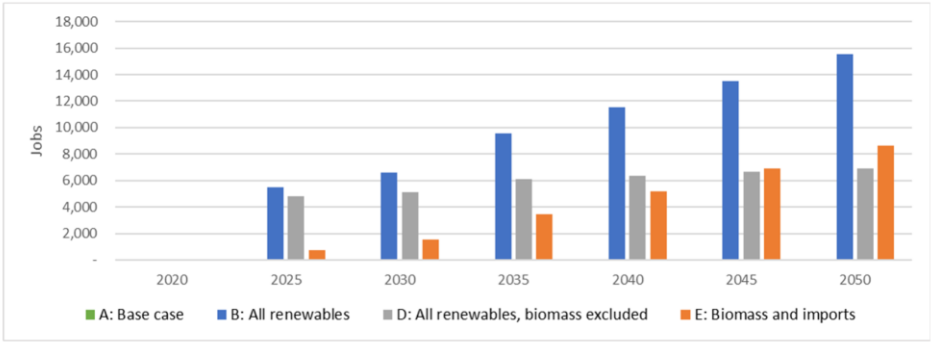
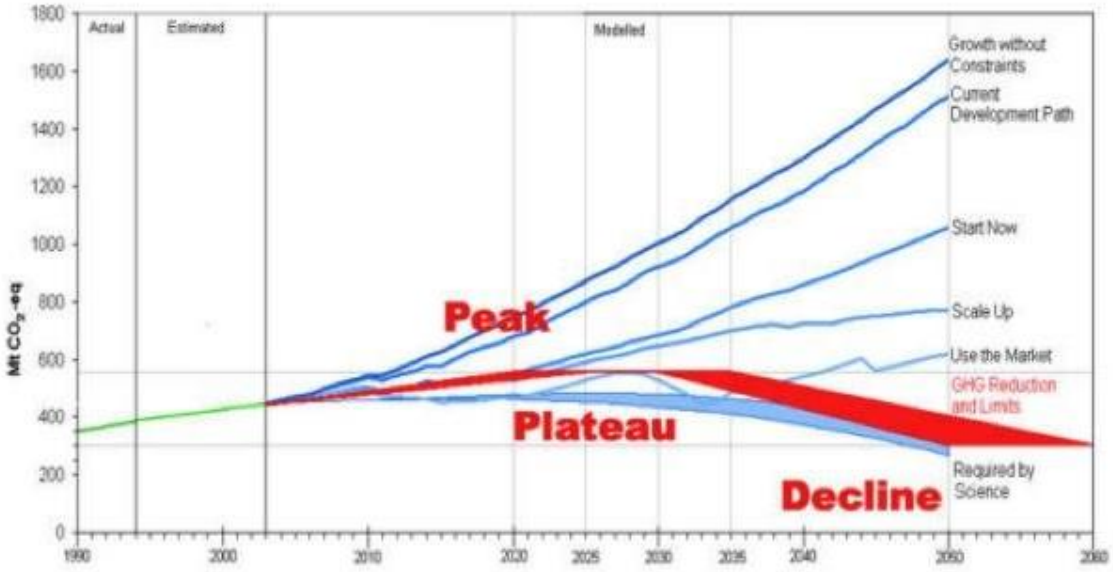


Figure 46: Cumulative job creation in eThekwini municipality from the construction and operation of renewable energy technologies.

IRP overall objectives / constraints

- The choice of projects may be guided by overall environmental and social targets:
  - Renewable energy percentage
  - Maximum emissions (changing over time)
  - Maximum tariff increase
  - Job creation
  - Increasing access to 100%
  - Electricity exports



South Africa IRP

An IRP can incorporate the relevant policy decisions

- Policy makers would want to know the implications of policy decisions
  - An IRP can provide useful insights on the implication of policy decisions
- For example an IRP can provide useful information for setting renewable energy targets:
  - What is the cost of achieving a renewable energy target?
  - Or
  - What is the implication on costs if I set x% as a renewable energy target.
  - Can we achieve the target with the available candidate power plants/resources?

- **Example from an IRP on the impact on costs from different policy targets to inform policy makers:**
  - ***Renewable energy target -*** *how much would it cost me to set a renewable energy target to 30% by 2030?*
  - *Security of supply target - How much would it will cost to set a 50% domestic energy restriction? Can it be achieved?*

Scenario	NPV Capex	NPV Fixed O&M	NPV variable costs	NPV Wheeling	NPV total costs	CO2 emis-sions	Average costs
	(m$)	(m$)	(m$)	(m$)	(m$)	Mt	($/MWh)
Base case	212	21	585	104	921	10	101
Renewable energy target 30% by 2030	283	38	591	88	1,000	8	108
Domestic energy >=50%	338	46	621	57	1,062	8	117

RE targets can guide the choice of projects or scenarios at a high level

- **IRP scenarios often include targets for RE penetration**
  - Reflect constraints set by national RE targets and targets
  - Decarbonization commitments from a country's Nationally Determined Contributions (NDCs)
  - Wider economic and political incentives (eg. development of RE industry)
- **Targets should be achievable**
  - IRP scenarios need to consider targets which are realistic as they will inform generation planning

RE targets considered selected SADC country planning documents

Country	Target	Note
Angola	7.5% 'new' RE by 2025	RE strategy
Botswana	20% by 2030 and 35% by 2040	Clean energy scenario in IRP Diversification considered as a strategic supply-side objective
Mozambique	Solar and wind to provide 10% of peak demand	20% sensitivity case
Namibia	70% by 2030	RE Policy
Seychelles	15% by 2030	
South Africa	Build limit on REs: 1,000MW for PV and 1600MW for solar	Aim to ensure constant pipeline of new projects

E/SIA assessment of the full IRP

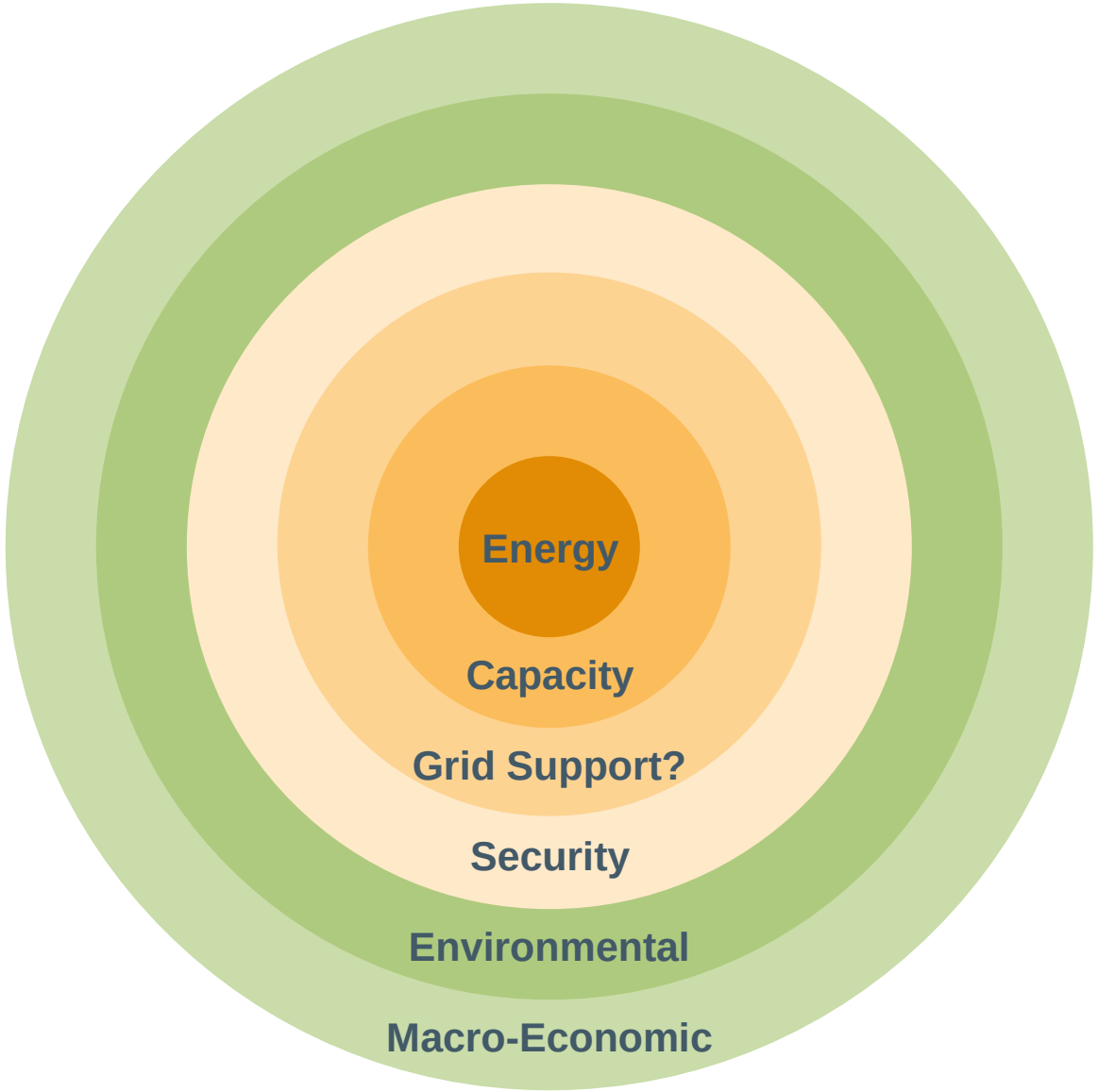
- The impacts of the IRP are assessed in aggregate as though a single project:
  - Total emissions
  - Impact on tariffs, then on economic growth
  - Job creation and reduction (by sector)

Tariff setting can affect the growth of an economy

- Pricing electricity on the basis of economic principles will ensure efficient use of the country's resources
  - The tariff informs consumers about the costs they are imposing on the system and encourages them to use electricity sparingly
  - Raising average tariffs to cost recovery levels will reduce the demand forecast growth
- The investment requirements in the IRP will thereby be reduced, typically at significant savings in costs
  - For the region as a whole, a 33% reduction in demand in the SAPP Pool Plan delivered a 23% saving in costs (US$ 60 billion)

- Peak demand drives up both short-run and long-run costs
  - SR: capacity costs are concentrated in peak hours and energy supply is usually provided by the most expensive generators.
  - LR: it is the overall system peak (plus reserve requirement) that is the principal driver of IRP generation costs
- Time of Use (ToU) pricing imposes a higher rate for consumption during peak hours.
  - Efficient customers shift their consumption away from peak to reduce their electricity bills
  - Can also have different pricing for different seasons and combined seasonal time of day (STOD)

Increased distributed generation can have positive externalities



FINANCIAL

ENERGY
- avoided fuel costs
- reduced system losses

CAPACITY
- avoided generation investment
- reduced network investment

GRID SUPPORT?
- unlikely but possible with advanced inverters

SECURITY
- diversification of supply services

SOCIAL (externalities)

ENVIRONMENTAL
- pollutants and carbon emissions
- land and water requirements

MACRO-ECONOMIC
- employment
- tax revenues

Stakeholder engagement is a part of the process but not social impact

- Exactly what stakeholders to engage will depend on the local context and scope of IRP.
- What stakeholders are engaged in the planning process in your country? Why are these chosen?

Electricity sector stakeholders	Public stakeholders	Consumers and other interest groups
• Utilities • Independent power producers • Transmission and distribution companies	• Regulator • Ministry of Energy • Ministry of Finance • Ministry of Water	• Domestic consumers • Unconnected households • Commercial and industrial consumers • Business groups (e.g. Chamber of Mines, Industry federation) • Environmental and social stakeholders

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At which stage(s) of the IRP process do you incorporate environmental and social aspects?

Individual project E/SIA

Costs/benefits incorporated into all projects for comparison

Comparison of project scenarios by environmental and social factors

IRP targets/constraints

E/SIA of the full IRP

Discussion questions

Which factors are calculated and incorporated in individual project analysis when comparing projects?

Environmental factors

Carbon emissions

Other emissions

Environmental damage

Social factors

Value chain job creation (and losses)

Energy access

Tax revenues

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