Meeting report

1st Transition Space meeting Volta River

12-13 March 2024

DAY 1 - Tuesday 12th March 2024

08:30 – 09:00	***Start Meeting (Coffee)***
09:00 - 12:30	❖ Welcome ❖ General presentation – EPIC Africa ❖ Presentations: ○ Introduction to transition theory ○ Role of Transition Spaces in EPIC Africa ○ Brief explanation on general concepts of sustainability (SDGs in particular) ❖ Getting to know each other / team building ❖ Agreeing on the Terms of Reference for the meeting
12:30 – 13:30	***Lunch***
13:30 – 17:30	❖ Group co-creation together with local students: Establishing understanding and visions for a sustainable WEF system in 2063
17:30 – 18:00	❖ Wrap-up

DAY 2 - Wednesday 13th March 2024

08.30 – 09:00	***Start Meeting (Coffee)***
09:00 – 12:30	❖ Harvesting main insights from Day 1 on a sustainable WEF system ❖ Deepening the group's systemic understanding of the values
12:30 – 13:30	***Lunch***
13:30 – 17:00	❖ Developing concepts for disruptive WEF innovations ❖ Introducing the OSeMOSYS model
17:00	***Closing the Transition Space meeting***

Participants

From the EPIC Africa consortium

Edo Abraham	TUDelft
Shravan Kumar	KTH
Shreyas Savanur	KTH
Carlos Guerrero Lucendo	VITO
Erik Laes	VITO
Yves De Weerdt	VITO
Rafatou Fofana	VBA
Salifou Dene	VBA
Eric Ofosu-Antwi	UENR
Mamud Musah	UENR
Felix Amankwah Diawuo	UENR
Samuel Akowuah Okyereh	UENR
Stephen Yaw Ntiamoah	UENR
Romeo Tweneboah Koduah	UENR
Simon Mulwa	KALRO

External participants

Tiendrebéogo Augustin	Bagrépôle
Kaboré Maïmouna	KBC (consumer representative organization)
Kassapoe Jesse	Water Resources Commission - White Volta
Joackim Agbumba	Water Resources Commission - Black Volta
Eric Muwla	Water Resources Commission - Accra
Christina Betty Taylor	Ghana Water Company Ltd.
Maxwell Akosah Kusi	Ghana Water Company Ltd.
Maxwell Boateng	Global Water Partnership
Winfred Nelson	National Development Planning Commission
Deborah Darko	Council for Scientific and Industrial Research
Abena Ofosu	International Water Management Institute
Mark Amoah Nyasapo	Ghana Atomic Energy Agency

What is a Transition Space?

Supporting transitions within the perspective of sustainable development requires an active involvement of different quadruple helix actors (civil society, private sector, government & administration, and knowledge institutes). All these actors have different ideas and visions regarding certain societal issues. However, to initiate and stimulate societal transitions a mutual understanding of one or more systemic issues and shared long-term actions is indispensable. A Transition Space (TS) is a way to reframe problem perceptions in the context of long-term visions of the different actors and to create a strong interaction between the members based on an agreement on relevant values. It is a systemic instrument to co-develop a common vision, an agenda, and a supporting network to tackle complex societal issues in a selective and strategic way. The TS members make up an innovation network, within which various perceptions of the persistent problem and possible directions for solutions can be deliberately confronted with each other and subsequently integrated.

DAY 1




In an introductory lecture on 'Transition Management and Systems Thinking,' the importance of applying different lenses to build a broad and comprehensive understanding of complex problems was stressed. The lecture zoomed in on a collective exploration of different lenses when looking at the WEF Nexus challenge. The lens of values and the lens of time were two important lenses the group worked around on the first day. At the start of Day 2, we asked the participants to list their most important take-aways from the introductory lecture on Transition Management. Below are the results.

Using different lenses to look at a complex problem	**Interconnectivity between issues (integrated lens)**	Looking back and looking forward	Connecting past and future	Bringing in the voice of the new generations	**Participation** process itself
Value of collective envisioning	Limits of extending of what we have now	Interbassin water exchange, food sovereignty, free energy	Values of the WEF	Multilevel lens	Acceleration to stabilization
Innovation -> change -> related challenges -> opportunities	DREAM!! Create a bank of ideas.	Make more use of technologies for societal value creation	L' approche de travail qui develope une collective intelligence,	Better understanding of link between energy and agriculture	Image of the future developed by youngsters
Desire of the students of attaining food sovereignty	Idea of free energy opens a societal debate on responsibility of resources (power of techno economic thinking versus power of social change	Need to inforce the voice of the young	Value conflict and value trade off?	Move from sharing water to sharing benefits	Iceberg model, simple as 1-2-3, circles in the sky
		Think about next steps in an integrated way	Keep our values top of mind		

Brainstorm on values that the WEF system has to deliver

First, an open and collaborative discussion was organized where the TS participants were encouraged to share their perspectives, experiences, and priorities regarding the desired outcomes and impacts of the water-energy-food (WEF) system on the Volta basin region. The broad range of values identified by the participants – who considered economic, social, environmental, as well as cultural dimensions of sustainability – is listed below:

- Peace
- Sufficiency
- Efficiency (Circularity: closing the loop among the WEF sectors)
- Access
- Optimal use
- No waste
- Security
- Keep value within the community
- Better coordination between basins --> related to avoiding conflicts
- Equity
- Not wasting money
- Avoiding pollution
- Economic growth, for the benefit of the people (Well-being)
- Transparency
- Sustainable growth and development / Sustainability
- Livelihoods
- Empowerment: increasing options for people
- Good health
- Biodiversity
- Accountability
- Good management
- Safety
- Solidarity
- Long-term perspective
- Ecosystem benefits
- Breaking down silos

The importance of this exercise is twofold. First it transcends classical sectoral thinking and puts thinking about the WEF Nexus in immediate relation with (a direction of) societal change. Secondly, it shows the impressive number of expectations that (often implicitly) are projected onto the WEF Nexus governance.

Future work

The outcome of the TS brainstorm on values will be further used to inform Deliverable 2.4 on "Transition objectives, criteria and indicators." A clustering methodology will be applied, composed of the following steps:

- **Review of the extensive list**, making sure that each value is clearly articulated, and duplicates are removed;
- **Identification of common themes or patterns;**
- **Creation of initial clusters;**
- **Iterative grouping and refinement** of the initial clusters, based on feedback of the TS participants;
- **Finalization of clusters and values;**
- **Incorporating clusters in Deliverable 2.4**

"From – to" exercise

TS participants were asked to look back at the major changes that occurred in WEF nexus management in Volta River Basin, and what the expected trends would be for the coming years:

A. What for you is the major change over the last 10-20 years related to WEF in the Volta River Basin?
B. What are the things that will change more dramatically over the next 10-20 years in the Volta River Basin related to WEF (expected change, not desired)?

Contrasting the current state ("from") with the expected future state ("to") allows participants to identify challenges or opportunities that need to be addressed during the transition (positive trends that can be reinforced, negative trends that need to be countered). This helps prioritize actions and interventions that will bridge the gap between the current and desired end state (cf. Future visions). Results of the exercise are reported in the table below.

What changed the most in the WEF nexus in the last 15 years?	What will change the most in the WEF nexus in the next 15 years?
Water • More water supply from groundwater. Because it is more widely distributed **Ecosystems** • Massive deforestation **Energy** • Increase in private car use that increases energy demand • Increase in public transport **Food** • More production, GMOs • Intensification of irrigation • Lower "patronage" for irrigation • More fishing **Transversal** • More integrated design of infrastructure • Change in the nexus narrative. More discussion on how sectors interact	**Water** • Trend continues **Ecosystem** • More deforestation **Energy** • Further increase in private car use **Food** • More Food availability • More conflicts for land **Transversal** • Sustainable Integrated WEF approaches to infrastructure planning • Increase in urbanization

• More impact in other sectors outside the WEF • More EIA for WEF infrastructure • Raising in self-sufficiency thinking • Increase on research although not always with the change in policymaking that is expected. • Governance improvement. Water diplomacy • Research more integrated in the communities. Increased participation (citizen science) • Increasing inequality	• More research and development on technology • Going back to the basics

Future visions on the Energy-Water-Food system in 2063

For constructing the future visions on a sustainable WEF system in 2063, the TS participants were joined by students from a local school (Achimota). The TS participants and students were subdivided into four groups. Each of these groups was asked to visualize a sustainable future for the WEF system in the Volta River Basin with the aid of creative materials that were available at the table. Next, participants were asked to reflect on the values (from the list) that were already reflected in their visions. Envisioning is a crucial step in the work of a TS. Envisioning helps participants articulate a shared vision of the desired future state of the system undergoing transition. By collectively imagining what success looks like, participants can set a clear direction for the transition process and align their efforts towards common goals and objectives. The visions will of course not be taken 'literally' but will serve as a guide for developing the scenarios and pathways that will be modeled with the aid of the OSeMOSYS model of the Volta River Basin. The work done in the first TS meeting sets up the potential building blocks for such visions, which have to be further articulated into coherent future storylines before the 2nd meeting of the TS (within one year).

Group 1 – The farm of the future

Group 1 created the farm of the future. At the heart of this futuristic farm lies a groundbreaking approach to food preservation. No longer will 30-40% of food succumb to waste. Through state-of-the-art refrigeration technology, food will be safeguarded at the farm, ensuring freshness and longevity.

But this farm is not just about growing crops; it is a dynamic ecosystem where food and energy intertwine. Here, a diverse mix of food and energy crops thrive, fostering healthy competition and maximizing productivity. Gone are the days of manual labor in the fields. With the introduction of hovering robotic harvesting and irrigation machines, only a handful of individuals are needed to oversee the operations of this high-tech farm.

Furthermore, the farm harnesses the power of cloud seeding technology to optimize water resources, ensuring bountiful harvests even in the face of unpredictable weather patterns. And with a local windmill generating energy to pump groundwater, sustainability is woven into every aspect of the farm's operations, ensuring that water scarcity is a thing of the past.

Thanks to advancements in genetic modification, crop yields have increased significantly, promising an abundance of nutritious food for all. Gone are the days of scarcity; the farm of the future ensures that no one goes hungry. Furthermore, agricultural leftovers are no longer seen as a problem; they are a valuable resource. Through innovative biogas production, leftovers are repurposed, providing a renewable source of energy to power the farm.

But perhaps most awe-inspiring of all is the transportation system. Utilizing a highly efficient magnetic rail system, food travels swiftly and seamlessly from the farm to inland markets, reducing waste and carbon emissions along the way.

Group 2 – Ghana in 2063

Group 2 built a model of the entire WEF system for Ghana in 2063. In the year 2063, Ghana stands as a shining example of sustainable development and technological innovation. At the heart of the nation's success story is its embrace of renewable energy, with hydroelectricity serving as the backbone of its energy provision. Ghana's vast network of hydroelectric dams harnesses the power of its abundant rivers, providing clean, reliable electricity to homes, businesses, and industries across the country.

But Ghana's commitment to renewable energy does not stop there. In addition to hydroelectricity, the nation has embraced wind and solar power, harnessing the energy of the sun and wind to further diversify its energy sources. Wind farms stretch across the coastline, while solar panels blanket the countryside, providing additional power to meet the nation's growing energy needs.

With a reliable and sustainable energy supply in place, Ghana has turned its attention to addressing food security and reducing food waste. In 2063, food storage facilities are strategically located close to farmers, ensuring that no food goes to waste. These state-of-the-art facilities are equipped with cutting-edge technology to preserve and store food, allowing farmers to safely store their harvests until they are ready to be distributed to markets and consumers.

But perhaps the most revolutionary innovation in Ghana's food system is the introduction of micro foods. These nutrient-rich, compact meals are designed to provide a quick and convenient source of nutrition for busy individuals. Simply sprinkle water on the micro food, and within minutes, you have a complete meal ready to eat. Micro foods are not only delicious and convenient but also environmentally friendly, requiring minimal resources to produce and transport.

In addition to its advancements in energy and food technology, Ghana has become a global leader in sustainable aviation. International flights arriving and departing from Ghana are powered by hydrogen, making the nation a global hub for eco-friendly travel. With its commitment to renewable energy, sustainable agriculture, and innovative technologies, Ghana has positioned itself as a beacon of progress and prosperity in the 21st century.

Group 3 – Community life in 2063

Group 3 created the image of a sustainable community in 2063. Picture this: floating serenely on the surface of the local water reservoir, a sea of solar panels glistens in the sunlight, harnessing the abundant energy of the sun to power the entire community. In this eco-friendly enclave, energy storage systems are seamlessly integrated, ensuring that the community has a reliable and uninterrupted power supply, even on cloudy days or during the night. And with electric vehicles gliding silently along the streets, powered by the sun's rays, transportation is not only emissions-free but also efficient and convenient.

But what truly sets this community apart is its innovative approach to agriculture. Here, every rooftop is transformed into a lush oasis of green, where residents tend to their own gardens and grow their own food. From vibrant vegetables to fragrant herbs, the community prides itself on growing what they eat, fostering a deep connection to the land and a sense of self-sufficiency.

Wastewater treatment is seamlessly integrated into every home, ensuring that water is conserved and recycled in a closed-loop system. From greywater recycling to composting toilets, every drop is precious in this sustainable community.

But perhaps the most remarkable feature of all is the community's embrace of flying vehicles for long-distance transport. With sleek, eco-friendly aircraft soaring through the skies, residents can easily travel to distant destinations without relying on fossil fuels or contributing to air pollution. This is a

vision of the future where sustainability and technology go hand in hand, transforming the way we live, work, and play.

Group 4 – A sustainable metropolis

Group 3 created a vision of a mega-city in 2063. As the sun rises over the horizon, the city springs to life with the gentle hum of renewable energy in the air. With solar panels adorning the rooftops of skyscrapers and wind turbines gracefully spinning in the breeze, the city harnesses the power of the sun and wind to supplement its abundant hydroelectricity, ensuring a reliable and sustainable energy supply for its bustling streets.

But the city's commitment to sustainability does not end there. Everywhere you look, buildings seamlessly integrate solar technology into their design, capturing the sun's rays to power everything from streetlights to air conditioning systems. Even the towering skyscrapers that dot the skyline serve as energy-generating powerhouses, with sleek, glass facades adorned with building-integrated solar panels.

High above the city streets, a marvel of modern engineering awaits: the skyscraper airport. Rising majestically into the sky, this vertical transportation hub serves as a gateway to the world, welcoming travelers from far and wide with its state-of-the-art facilities and breathtaking views of the city below.

But it is not just the airport that defies convention in this futuristic city. In the heart of the metropolis, space malls float serenely in the sky, offering an otherworldly shopping experience that combines cutting-edge technology with breathtaking design. With shops, restaurants, and entertainment venues housed in sleek, futuristic structures, these space malls are a testament to the city's bold vision for the future of urban living.

And when it comes to getting around, the city's residents enjoy a network of electric self-driven cars for intercity transport, whisking them effortlessly from one destination to another with zero emissions and maximum efficiency. For those seeking a more adventurous mode of transportation, sky Uber services offer a bird's-eye view of the city, allowing passengers to soar above the streets in sleek, electric-powered aircraft.

But perhaps the most awe-inspiring feature of all is the city's water reservoir, a vast expanse of shimmering blue that stretches out to the horizon. Fed by desalinated water from the ocean, this reservoir is a lifeline for the city, providing a sustainable source of fresh water for its residents and ensuring that the city thrives even in the face of drought and climate change.

Group 5 – A sustainable Volta River Basin

Group 3 created a vision of a sustainable Volta River Basin in 2063. In 2063, the power of water is harnessed in every conceivable way, from hydroelectric dams that dot the landscape to innovative tidal wave energy systems that harness the ebb and flow of the tides. In this sustainable paradise, the skies are filled with the gentle hum of hydrogen-powered flying cars, soaring gracefully through the air with zero emissions. These futuristic vehicles represent the pinnacle of clean transportation technology.

On the ground, water farms stretch as far as the eye can see, tended to by robotic farmers who work tirelessly to cultivate crops using the region's abundant water resources. These water farms not only produce nutritious food for the local communities but also serve as a model of sustainable agriculture, using organic fertilizer and innovative irrigation techniques to minimize waste and maximize yield.

The sun plays a crucial role in this sustainable ecosystem as well. Solar panels adorn every building, capturing the sun's energy and converting it into clean, renewable electricity to power homes, businesses, and industries throughout the region.

And when it comes to water management, the people of the Volta River Basin have perfected the art of diplomacy. Through a sophisticated network of water channels and reservoirs, excess water from the rainy season in Burkina Faso is stored and transported to Northern Ghana to cover the dry season, ensuring a reliable supply of water for agriculture, industry, and daily life.

DAY 2

Specification of values for a sustainable WEF Nexus management

At the start of Day 2, the TS participants were asked to delve further into the application of the values listed in Day 1 to sustainable WEF Nexus management. To that end, the values were clustered into 4 themes, and the TS participants were divided in 4 groups to work on the 4 themes. For each theme, the subgroups were asked to reflect on the question how a WEF nexus project could practically contribute to realizing the values listed in the themes. Results of group discussions are presented below.

Group 1 – Human Dignity

Group 1 came up with the following requirements to promote Human Dignity through WEF Infrastructure in the Volta River Basin:

1. Introduce the Concept of Community Livelihoods:

- Expand the scope of WEF infrastructure planning to include community livelihoods beyond just water, incorporating aspects such as forestry, energy, land management, and agriculture. Recognize the interconnectedness of these sectors and their impact on human well-being and dignity.
- Develop holistic strategies that promote sustainable livelihoods for local communities, including initiatives to enhance agricultural productivity (e.g., promote storage solutions), promote agroforestry, support small-scale fisheries, and facilitate access to markets and value chains.

2. Ensure Sufficient Access to Community Livelihoods:

- Translate human rights issues into terms of ensuring sufficient access to community livelihoods for all residents of the Volta River Basin. This includes legal rights to redress grievances,

equitable access to natural resources, and affirmative action measures to empower marginalized communities and promote social inclusion.

- Encourage local students to study local resource management and return to their communities to contribute expertise and suggest innovative solutions for sustainable WEF infrastructure development. Invest in education and capacity-building initiatives to nurture local talent and promote Indigenous knowledge systems.

3. Develop Water Livelihoods:

- Promote the development of small reservoirs for fishing and irrigation to support water-based livelihoods in rural communities. Implement community-based fisheries management approaches and sustainable aquaculture practices to ensure the long-term viability of aquatic resources.
- Invest in decentralized water supply and sanitation infrastructure to improve access to clean water and sanitation services in rural areas, reducing dependence on polluted water bodies and mitigating health risks associated with waterborne diseases.

4. Expand Energy Infrastructure:

- Accelerate the expansion of energy infrastructure, focusing on decentralized solutions to improve electricity access in rural areas. Prioritize investments in renewable energy technologies such as solar, wind, and mini-hydro power to enhance energy security and promote environmental sustainability.
- Capitalize on Ghana's gas resources and leverage the West African Power Pool (WAPP) to facilitate regional cooperation in energy trade and infrastructure development. Explore the potential of nuclear power for supplying baseload demand, particularly for industrial applications such as aluminum smelting, while complementing it with intermittent renewable energy sources.

5. Implement Desalination Plans:

- Develop a comprehensive desalination plan to address water scarcity and pollution in the Volta River Basin. Invest in desalination technologies and infrastructure to treat saline and contaminated water sources, providing clean and reliable water for domestic, agricultural, and industrial use.
- Integrate desalination projects with broader water resource management strategies, including watershed protection, pollution control, and water conservation measures, to ensure the sustainability of water supplies and safeguard ecosystem health.

Group 2 – Basic Needs

Group 2 came up with the following requirements for ensuring basic needs are met in the exploitation of Water-Energy-Food Resources in the Volta River Basin:

1. Guard Peace:

- Establish a grievance address mechanism to provide a platform for local communities to voice concerns, resolve disputes, and address grievances related to WEF initiatives. This mechanism should be accessible, transparent, and impartial, ensuring fair treatment and timely resolution of issues.
- Set up communication channels for feedback to facilitate open dialogue and engagement between project stakeholders, including local communities, government agencies, and project developers. Regular community meetings, surveys, and feedback mechanisms should be established to solicit input and ensure community participation in decision-making processes.
- Ensure a minimum amount of local involvement in WEF initiatives by promoting community participation in project planning, implementation, and management. This includes involving

local stakeholders in decision-making processes, providing training and capacity-building opportunities, and fostering partnerships with local organizations and institutions.

2. Guarantee Access to WEF Resources and Benefits:

- Implement affirmative actions to ensure fair access to WEF resources and benefits for local communities. This may include policies to promote minimum quotas for local employment (e.g., minimum 25% local employment), preferential procurement from local businesses, and equitable sharing of social and economic benefits.
- Empower vulnerable groups, including women, youth, and marginalized communities, by providing access to education, training, and economic opportunities related to WEF initiatives. Promote inclusive participation in decision-making processes and ensure that the needs and priorities of vulnerable groups are considered.
- Ensure fair compensation for eventual damages caused by WEF initiatives, such as the relocation of communities when constructing dams or other infrastructure projects. Develop transparent and equitable compensation mechanisms based on international standards and best practices and ensure that affected communities are adequately consulted and compensated for any losses or disruptions.

3. Guarantee Sufficiency:

- Avoid overconsumption of WEF resources by promoting sustainable resource management practices and adopting technologies that minimize waste and optimize resource use. Strive for synergies between the water, energy, and food sectors to maximize efficiency and minimize resource depletion.
- Conduct prior evaluations of available technological WEF options based on 'best available technology' assessments. This involves identifying and selecting technologies and practices that are environmentally sustainable, socially acceptable, and economically feasible, considering local context and community preferences.

4. Ensure Safety:

- Organize prior comparative risk assessments of different WEF options to identify and mitigate potential risks and hazards. This includes assessing environmental impacts, social risks, and potential health and safety hazards associated with WEF initiatives.
- Conduct sensitization and awareness-raising campaigns to educate local communities about potential risks and hazards associated with WEF initiatives and promote safety measures and precautions.
- Install early warning systems to alert communities about potential risks and emergencies, such as floods, droughts, or infrastructure failures. Develop contingency plans and emergency response mechanisms to ensure rapid and effective response to crises and disasters.

5. Ensure security:

- Develop a comprehensive, long-term integrated plan for water, energy, and food resources in the Volta River Basin. This plan should be based on a thorough assessment of current and future needs, challenges, and opportunities, and should prioritize integrated resource management with a view on long-term sustainability.
- Include guarantees in the plan that enough resources will be left for future generations.
- Ensure the integrity of the resource (e.g., phase out illegal mining).
- Promote transboundary resource sharing.

Group 3 – Good Governance

The following requirements for good governance of the WEF resources in the Volta basin region were proposed:

1. Create a Long-Term Integrated WEF Plan:

- Develop a comprehensive, long-term integrated plan for water, energy, and food resources in the Volta River Basin. This plan should be based on a thorough assessment of current and future needs, challenges, and opportunities, and should prioritize integrated resource management with a view on long-term sustainability.
- Ensure that the integrated plan considers and integrates the plans from the different ministries responsible for water, energy, and food (WEF) infrastructure. Foster collaboration and coordination among relevant ministries to ensure coherence and alignment of goals and strategies.

2. Establish an Oversight Agency:

- Establish an independent oversight agency with the mandate to monitor and coordinate the implementation of the integrated WEF plan. This agency should have the authority to oversee all WEF infrastructure plans, ensure compliance with regulations and standards, and promote transparency and accountability in decision-making processes.
- The oversight agency should also facilitate real stakeholder engagement (instead of just providing information) and promote public participation in planning.

3. Promote Private Sector Participation:

- Encourage greater participation of private sector actors in WEF infrastructure projects through public-private partnerships (PPPs), concessions, and other innovative financing models. Provide incentives and create a conducive regulatory environment to attract private investment in WEF projects while safeguarding public interests and ensuring accountability.

4. Manage Corruption and Accountability:

- Implement measures to enhance transparency, integrity, and accountability in WEF governance. Require politicians to declare their assets and interests and establish mechanisms to manage conflicts of interest effectively.
- Strengthen anti-corruption laws and enforcement mechanisms and impose harsh penalties for corrupt practices in the construction and management of WEF infrastructure projects. Establish mechanisms for monitoring construction activities and reporting progress to local communities to prevent corruption and ensure quality and timely delivery of infrastructure projects.

5. Foster Power Sharing and Democratic Governance:

- Review and revise presidential powers through constitutional changes to promote greater checks and balances, transparency, and accountability in decision-making processes related to WEF governance.
- Enforce existing laws and regulations more effectively to ensure equal access to WEF resources and equitable distribution of benefits among all stakeholders, including marginalized communities.

6. Ensure Collective Stakeholder Buy-In:

- Foster genuine engagement of stakeholders in the WEF planning and decision-making processes. Provide resources and support for affected communities to actively participate in decision-making, including access to information, capacity-building initiatives, and opportunities for meaningful dialogue and consultation.
- Examine existing laws, policies, and regulations to identify areas for improvement and alignment with sustainable WEF management principles. Learn from experiences in other

countries and best practices to inform policy development and implementation in the Volta River Basin.

7. Prioritize Synergies and Equity:

- Prioritize synergies between existing WEF projects to maximize outcomes and minimize trade-offs. Stakeholders should be willing to make trade-offs and sacrifices to achieve more even distribution of costs and benefits across the basin.
- Promote equitable access to WEF resources and opportunities for all stakeholders, including marginalized groups and vulnerable populations. Ensure that the benefits of WEF projects are shared equitably and contribute to inclusive and sustainable development in the Volta River Basin.

Group 4 – Sustainable Resource Management

To establish an integrated water-energy-food (WEF) project in the Volta basin region while considering the various elements of sustainable resource management, the following requirements were proposed:

1. Develop a Long-Term Vision and Strategy:

- Engage in dialogue with regional government and stakeholders to formulate a comprehensive vision and strategy for integrated resource management.
- Assess land use plans, including activities like mining, and urbanization plans through an integrated resource management lens to ensure alignment with the long-term vision.

2. Consideration of Water Use Impacts:

- Evaluate the impact of new WEF initiatives on existing water uses within the community.
- If trade-offs are inevitable, transparently account for them and engage stakeholders in decision-making processes.

3. Integration of Water Conservation Strategies:

- Incorporate water-saving measures and water recycling practices into the design and implementation of every WEF initiative.

4. Community-Centric Sustainable Growth:

- Prioritize the well-being and development of the local community in all WEF initiatives.
- Ensure that benefits generated by the initiatives directly contribute to community prosperity and resilience.

5. Incorporate Benefit Sharing Mechanisms:

- Integrate benefit sharing mechanisms into the conception phase of every WEF initiative to ensure equitable distribution of costs and benefits among the local community.

6. Empowerment and Local Participation:

- Enhance community understanding of the values and implications of WEF initiatives.
- Facilitate local participation in project activities, such as through local employment opportunities and culturally sensitive project design.

7. Promote Local Ownership:

- Foster increased local ownership of WEF initiatives through community engagement and empowerment.
- Establish mechanisms to ensure ongoing community involvement and commitment to project sustainability.

8. Encourage Pesticide-Free Cooperatives:

- Support the growth of pesticide-free agricultural cooperatives to promote sustainable farming practices and protect local ecosystems.

9. Corporate Social Responsibility (CSR) Integration:

- Encourage private companies involved in WEF initiatives to incorporate community empowerment into their CSR strategies.

10. Environmental Protection and Biodiversity Conservation:

- Ensure that every WEF initiative minimizes negative impacts on the local environment, particularly biodiversity.
- Aim to incorporate nature restoration and biodiversity enhancement components into local WEF projects whenever feasible.

Description of 3 disruptive WEF cases

To make the values and principles more tangible, the TS participants were divided into 3 sub-groups that each discussed an innovative practice invented by the TS facilitators. Participants were asked to describe how each of these cases would work in practice (who would be involved, what would the practice achieve, how would decisions be made, etc.).

1. **Water Families**
2. **First Transboundary WEF project**
3. **Water Farm**

Water Families

The concept of a "water family" is a metaphorical term used to describe the interconnectedness and interdependence of water resources and the communities that rely on them. In essence, it highlights the idea that all individuals, communities, and ecosystems that share a common water source are part of a larger "family" that depends on and impacts the health and sustainability of that water resource. The Volta basin 'family' includes the following members:

- The most vulnerable members of the community are those residing in the flood-prone areas surrounding the dams. These individuals are often forced to evacuate periodically, leaving behind their homes and possessions, only to return and rebuild everything from scratch.
- Households situated along the banks of the Volta River rely on it for washing and bathing purposes. However, they are at risk of encountering health issues due to pollution in the river.
- Navigation along certain sections of the river becomes treacherous during the dry season, primarily due to the presence of hardwood trees. This poses a significant safety hazard for boat travel, particularly impacting children's ability to attend school for approximately six months of the year.
- Smallholder farmers bear the brunt of the dry season, experiencing difficulties in sustaining their livelihoods without adequate water resources for irrigation and crop cultivation.
- In addition, during the dry season they suffer from conflicts between herders (animal farmers) and the crop farmers.
- Fishermen operating in the Volta River face challenges stemming from plastic pollution (mainly from sachet water), which not only affects their catch but also poses environmental and health risks.
- While hardwood logging companies reap substantial profits from wood exports, local communities receive disproportionately minimal benefits from these activities.
- The creation of the Akosombo dam lake has unlocked opportunities for fishing and tourism, leading to the establishment of hotels and local markets. This has resulted in increased employment opportunities for locals and enhanced job security for fishermen.

- Despite the benefits derived from the Akosombo dam, a sizable portion of the electricity generated is primarily allocated for aluminum smelting. The company involved benefits from access to low-cost electricity under a long-term contract, while the broader community's access to affordable electricity remains limited.

In essence, adhering to the principle of a 'family dynamic,' the concept suggests that the more affluent 'family members'—such as the wood logging company or the proprietor of the Akosombo dam—should extend support to the more disadvantaged counterparts. As an example, a proposal was put forth to utilize the hardwood found in the Volta River to construct a community of stilt houses, utilizing the hardwood as the foundational pillars, to accommodate those displaced by the Akosombo dam floodings.

First Transboundary WEF Project

Participants in this sub-group created a storyline: The first transboundary water-energy-food (WEF) project between Burkina Faso and Ghana aims to foster collaboration, enhance resilience, and promote sustainable development in the shared Volta River Basin. This project integrates flood management, water resource management and data sharing, water diplomacy, and management of migration movements caused by climate impacts, while leveraging organic manure upstream to positively impact downstream areas in the Black Volta. Additionally, the project seeks to transcend trade competition, promote common food production, and integrate value chains to enhance nutritional value and promote shared transport infrastructure.

1. Flood Management:

- Develop a coordinated flood management strategy that considers the transboundary nature of the Volta River Basin.
- Implement flood forecasting and early warning systems to mitigate risks and minimize the impact of flood events on communities and infrastructure.
- Enhance infrastructure resilience through the construction of flood defenses, such as levees, embankments, and flood barriers, in vulnerable areas.

2. Water Resource Management and Data Sharing:

- Establish mechanisms for joint water resource management and data sharing between Burkina Faso and Ghana.
- Implement a transboundary water monitoring network to collect and share hydrological data, including water levels, flows, and quality parameters.

3. Water Diplomacy:

- Foster dialogue, cooperation, and mutual understanding between Burkina Faso and Ghana through water diplomacy initiatives.
- Facilitate diplomatic negotiations and conflict resolution mechanisms to address shared water challenges and promote equitable allocation of water resources.
- Strengthen institutional frameworks and governance structures for transboundary water management, including the establishment of joint committees or commissions.

4. Management of Migration Movement due to Climate Impacts:

- Develop strategies to manage migration movements caused by climate impacts, such as droughts, floods, and water scarcity.
- Enhance resilience and adaptive capacity of communities through livelihood diversification, sustainable agriculture practices, and alternative income-generating activities.

- Provide support and assistance to displaced populations, including access to basic services, livelihood opportunities, and social protection mechanisms.

5. Utilization of Organic Manure Upstream:

- Promote the use of organic manure upstream to improve soil fertility and agricultural productivity.
- Provide training and capacity-building programs for farmers on sustainable land management practices, composting techniques, and organic farming methods.
- Monitor and evaluate the impact of organic manure on downstream water quality and ecosystem health, particularly in the Black Volta.

6. **Transcending Trade Competition:**

- Establish shared value chains for key agricultural commodities, such as grains, fruits, and vegetables, to ensure food security and enhance nutritional value.
- Coordinate seasonal production and market demand to optimize supply chains and reduce food waste, including the import and export of agricultural products between Burkina Faso and Ghana.
- Link value chains and promote the integration of agricultural production and processing facilities to enhance efficiency and value addition.
- Explore opportunities for shared transport infrastructure, such as roads, railways, and ports, to facilitate the movement of goods and reduce logistical costs.

Water Farm

The Water Farm of the future includes the following elements:

1. Fish farming/aquaculture:

- Implementation of aquaculture practices in designated areas within the Volta basin region to foster sustainable fish farming.
- Establishment of fishponds or floating cages to rear various fish species, such as tilapia or catfish, for commercial purposes and local consumption.
- Integration of modern aquaculture techniques, including water quality management, feeding regimes, and disease control, to optimize fish production and ensure environmental sustainability.

2. Providing Irrigation for Agriculture:

- Utilization of water resources from the Volta River for irrigation purposes to support agricultural activities in surrounding areas.
- Implementation of drip irrigation systems or canal networks to efficiently distribute water to farmlands, minimizing water wastage and maximizing crop yields.
- Promotion of water-saving agricultural practices, such as mulching, crop rotation, and drought-resistant crop varieties, to enhance water productivity and resilience to climate variability.

3. Planning Agriculture to Preserve Water Quality:

- Adoption of sustainable land management practices to prevent soil erosion and sedimentation of the river, thereby maintaining water quality and ecosystem health.
- Implementation of soil conservation measures, such as contour plowing, terracing, and agroforestry, to minimize runoff and soil loss from agricultural fields.

- Integration of riparian buffer zones and vegetative cover along riverbanks to reduce sedimentation and nutrient runoff into the water bodies, preserving water quality for aquatic organisms and human consumption.

4.Biofuel Production from Agriculture Waste:

- Utilization of agricultural residues, such as crop residues, straw, and husks, as feedstock for biofuel production to drive mechanical harvesting machines and other farm equipment.
- Establishment of bioenergy plants or biogas digesters to convert agricultural waste into biofuels, such as biogas or biodiesel, for on-farm energy needs or local energy markets.
- Integration of biofuel production with sustainable agricultural practices to promote circular economy principles and reduce reliance on fossil fuels, contributing to climate change mitigation efforts.

5. Floating Solar Energy:

- Installation of floating solar photovoltaic (PV) panels on water surfaces, such as fishponds or reservoirs, to harness solar energy for electricity generation.
- Deployment of innovative floating solar technologies that minimize land use and environmental impact while maximizing energy production potential.

Conclusion

In conclusion, the 1st Transition Space meeting of the Volta River Basin has provided a vital platform for participants to engage in collaborative dialogue and action towards the sustainable management of water-energy-food systems. Through insightful discussions, shared experiences, and diverse perspectives, we have identified key values, principles, and building blocks for advancing sustainability in these critical sectors. The results of this first meeting will be further developed into tangible assets that serve to support the overall ambition of the EPIC Africa project:

- Values will be clustered and further developed into criteria and indicators (Deliverable 2.4, to be submitted in October 2024).
- Principles will be clustered and further articulated into guiding principles for the design of the Volta River Basin model, as well as the scenarios and pathways developed with the aid of the model.
- Disruptive WEF cases (possibly complemented by others) will serve as inspiration to build scenario pathways.

Annex 1 – Transition Management presentation

Welcome to transition space!

Accra, March 2024

Erik Laes & Yves De Weerdt (VITO Nexus), with
support from Carlos Guerrero and Léa Tatry (VITO)

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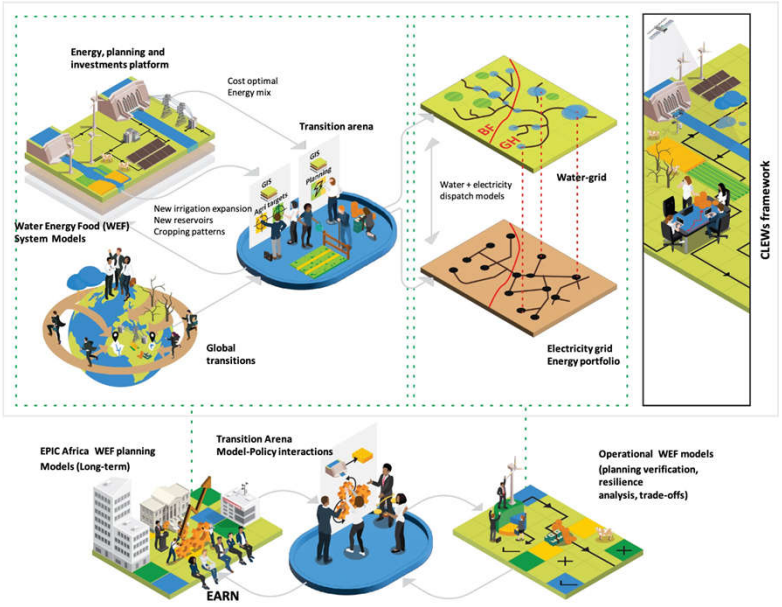
Energy **P**lanning and Modelling through **I**ntegrated Assessment of **C**limate-Land-Energy-Water Nexus in Sub-Saharan **Africa**: *the Cases of the Volta and Tana River Basins*

EPIC AFRICA
Sustainable water energy food pathways

EPIC Africa approach



Operationalizing integrated approaches in infrastructure planning using **open-source** tools with **community of users**

- Create African experts and expertise in this area: **EPIC Africa Research Network** for co-creating tools and data
- **Transition management: spaces** to deliberate on visions, priorities, locally-led capacity mobilization on nexus and science-policy interactions
- Integrated models of **water-energy-food** to study interactions between water-energy-land resources and their **operational and spatial aspects**

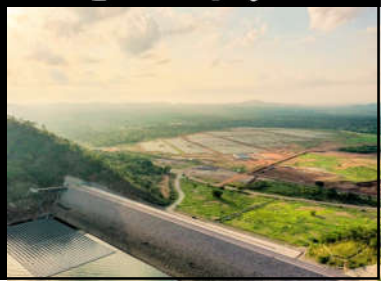
Stakeholders driving questions/models to be considered

- storage in RE rich systems?

- grid expansion and affordability?

- water resources development and environmental protection

- irrigation development



Transition Spaces

Function

- They serve as the **EPIC Africa "think tank"**
- Membership based on ability to **generate ideas/visions about long-term future of WEF system** in the two river basins
- Interaction between transition spaces and stakeholder group based on output of **TS meeting 3: pathways & trade-offs**
- Interaction between **transition spaces and modelling**:
  1. Define WEF system dynamics and their representation in the WEF models
  2. Create visions / transition pathways that will serve to define the parameters within the scenario modelling

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Stakeholder participation + transition management = Epic power!

Charachteristics

- Stakeholder participation
  - Representation logic
  - Has to provide legitimacy..
  - .. For political action
- So:
  - Government and politics are leading
  - Science to policy logic

- Transition management
  - Common good logic
    - Transcending interest representation
  - Connects with societal dynamics…
  - .. To empower sustainable societal change processes
- So:
  - Citizens and civil society are leading, government participates in co-creation, policy development in support
  - Science to society logic

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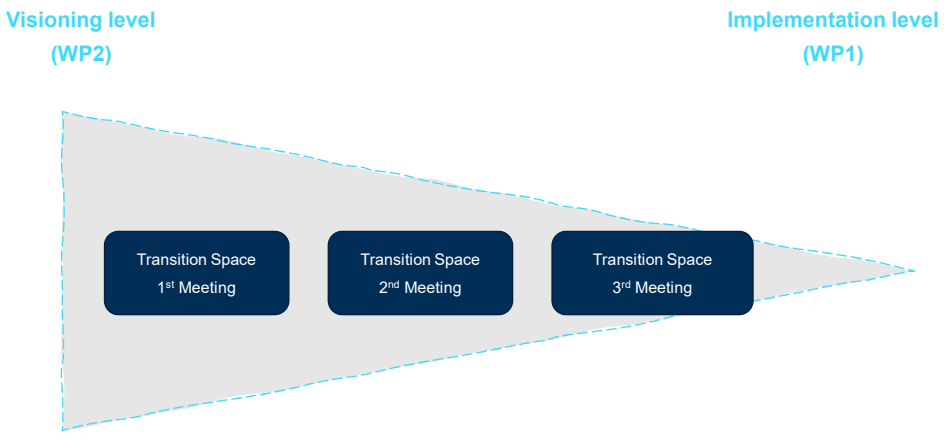

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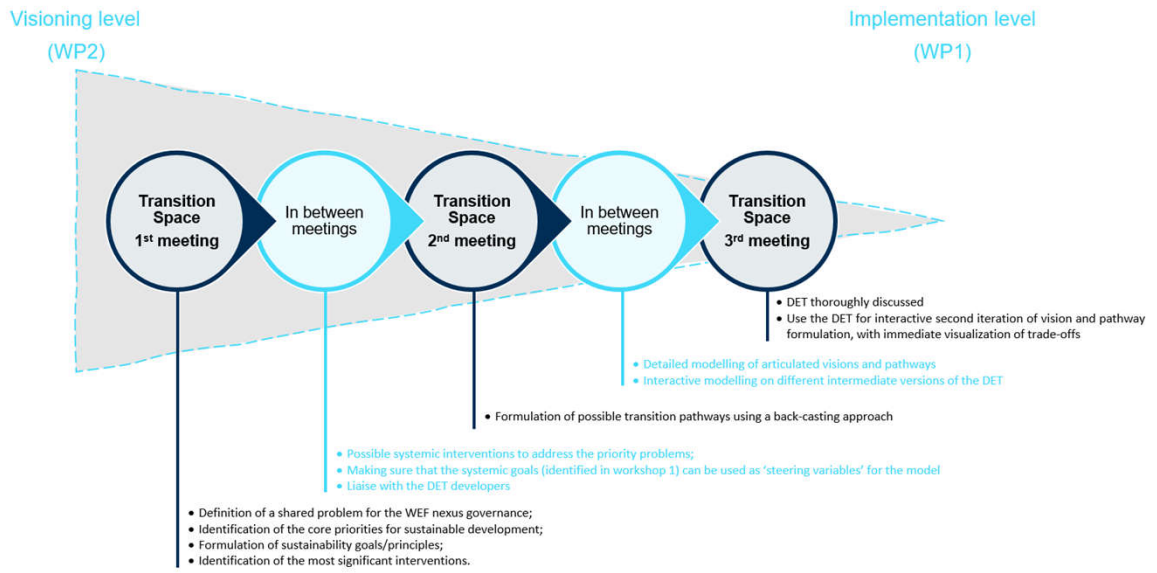
Visioning level
(WP2)
Implementation level
(WP1)
Transition Space 1st meeting
In between meetings
Transition Space 2nd meeting
In between meetings
Transition Space 3rd meeting
• DET thoroughly discussed
• Use the DET for interactive second iteration of vision and pathway formulation, with immediate visualization of trade-offs
• Detailed modelling of articulated visions and pathways
• Interactive modelling on different intermediate versions of the DET
• Formulation of possible transition pathways using a back-casting approach
• Possible systemic interventions to address the priority problems;
• Making sure that the systemic goals (identified in workshop 1) can be used as 'steering variables' for the model
• Liaise with the DET developers
• Definition of a shared problem for the WEF nexus governance;
• Identification of the core priorities for sustainable development;
• Formulation of sustainability goals/principles;
• Identification of the most significant interventions.

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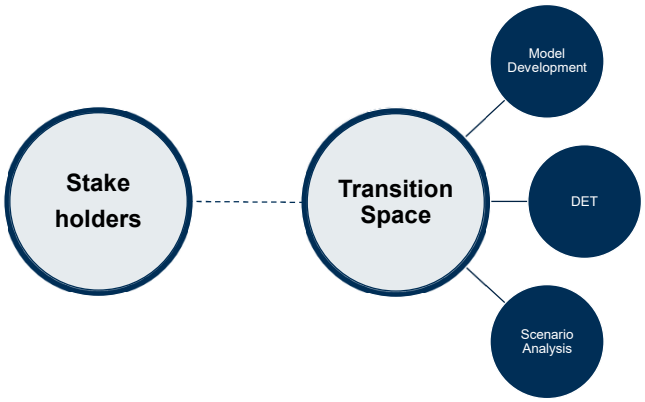
SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS



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Some possible outcomes at the end of the TS

- An EPIC transition agenda
  - Embedded in the local context
  - Connected with practice ‘on the ground’

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Transitions & transition management?

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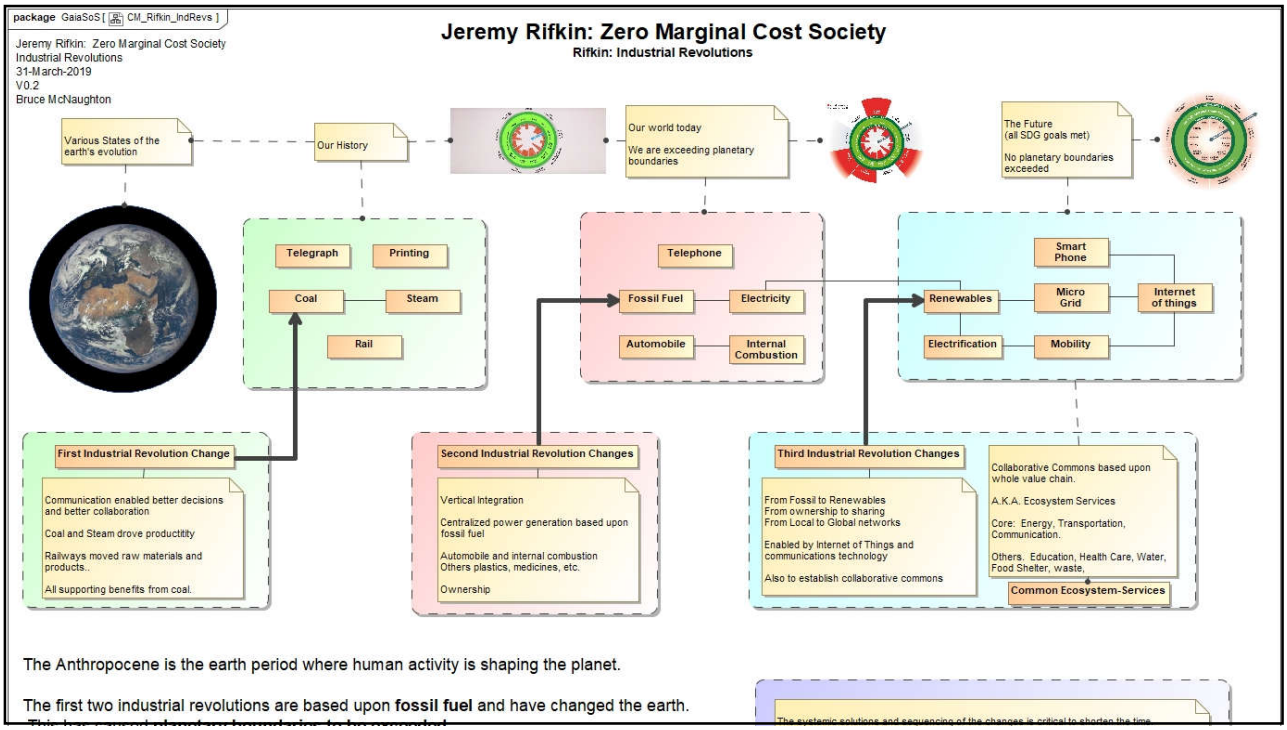

Transitions versus sustainability transitions

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Sustainability transitions are non-linear, long-term and fundamental change processes towards sustainability that alter the way society is organised (e.g. physical infrastructures, institutions), values services and amenities (e.g. values and norms) and operates (e.g. production routines) (Rotmans et al., 2001, Frantzeskaki and Loorbach, 2010, Markard et al., 2012)

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But can you manage transitions and why would you want to?

Transition theory: way of looking

Transition management: frame for action

- Inter- and transdisciplinary in nature
- Long term perspective
- Systems perspective
- Co-creation

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Draw
‘Making toast’

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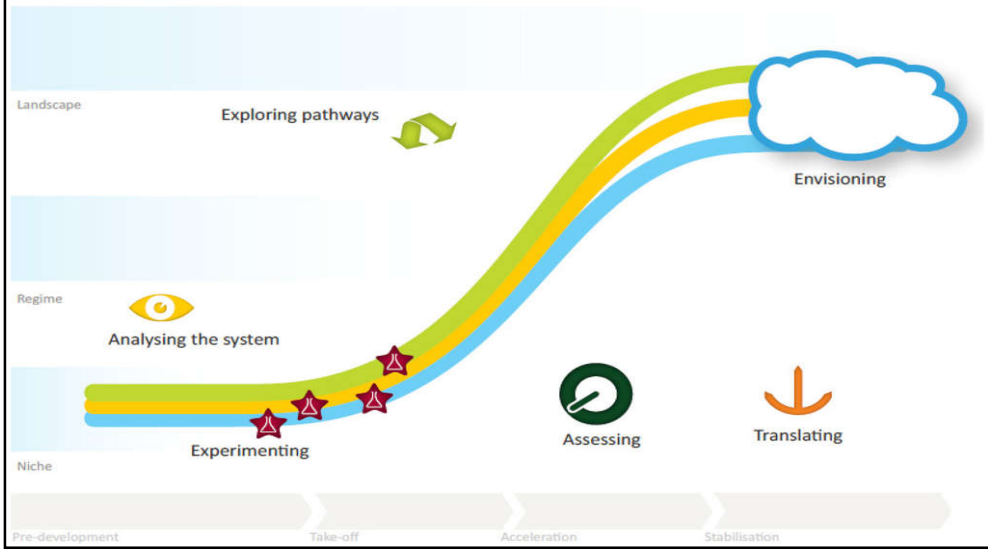
HOW MIGHT TRANSITIONS HAPPEN

A framework of 3 lenses for looking at systemic changes for sustainability.



Read all about it HERE

LENS 1: MULTILEVEL

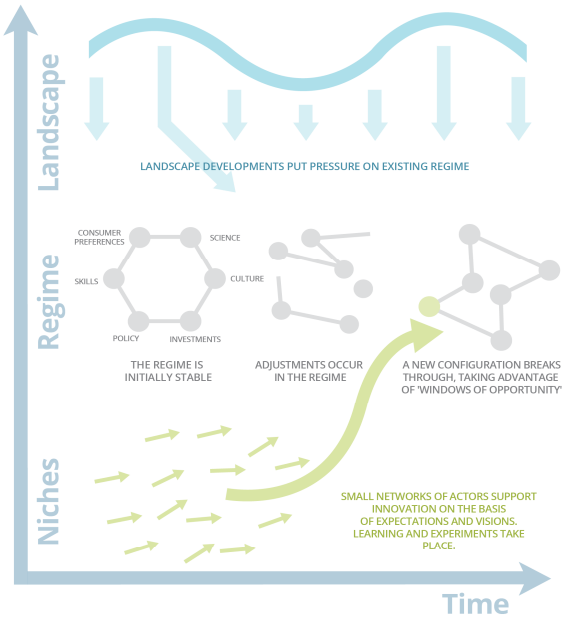
A framework of 3 lenses for looking at systemic changes for sustainability.

LANDSCAPE (MEGATRENDS, SOCIETAL TENDENCIES, 'MACRO'-CHARACTERISTICS)

REGIME ('Well, that's just how we do it here')

NICHE (What's brewing? Where are people and/or organizations doing things really different?)

A multilevel perspective to societal change



Source: Based on Geels, 2002.

LENS 2: MULTI-PHASE

A framework of 3 lenses for looking at systemic changes for sustainability.

LENS 2: MULTI-PHASE

A framework of 3 lenses for looking at systemic changes for sustainability.

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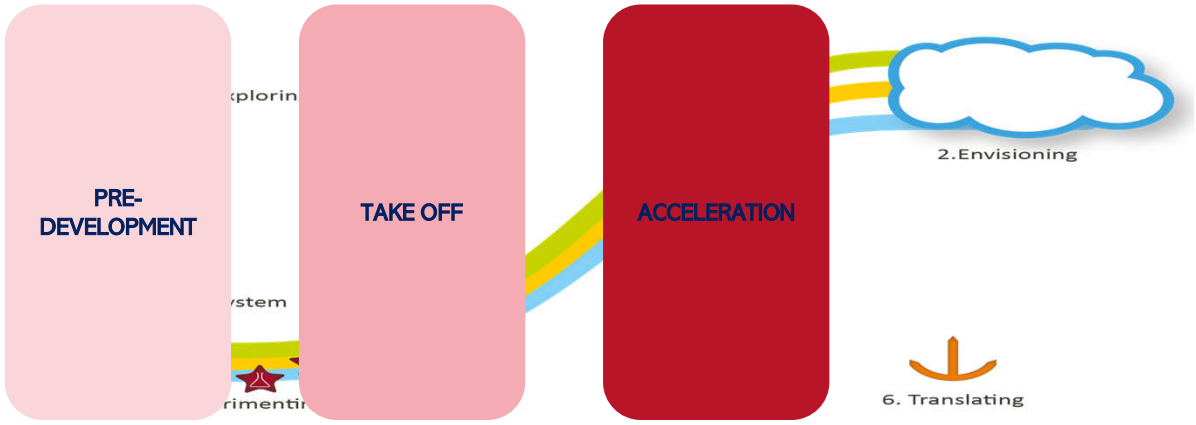
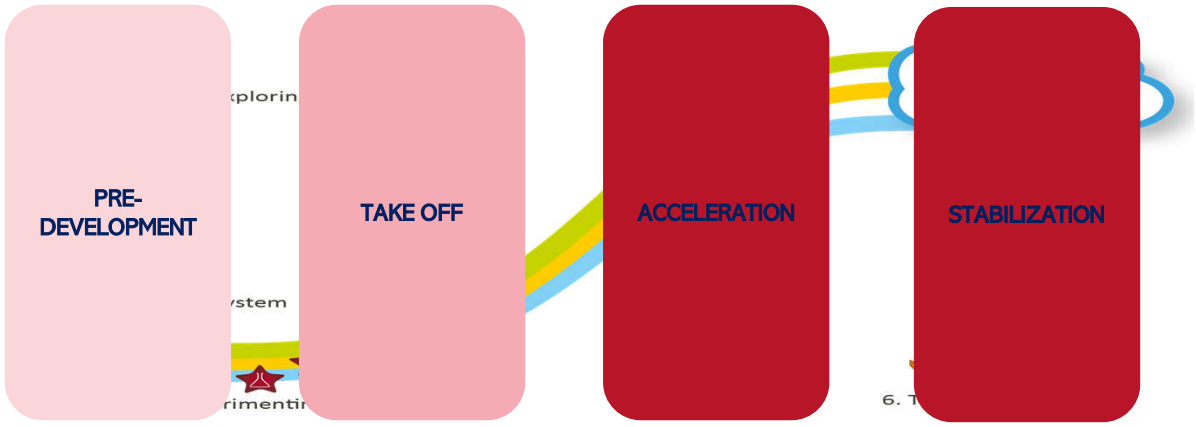
A framework of 3 lenses for looking at systemic changes for sustainability.



LENS 2: MULTI-PHASE

A framework of 3 lenses for looking at systemic changes for sustainability.



LENS 3: MULTI-ACTOR

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Managing?
Governing!

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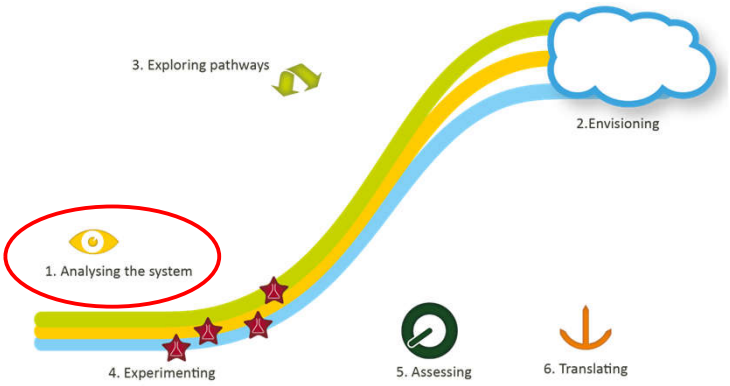
How could you manage or govern a transition

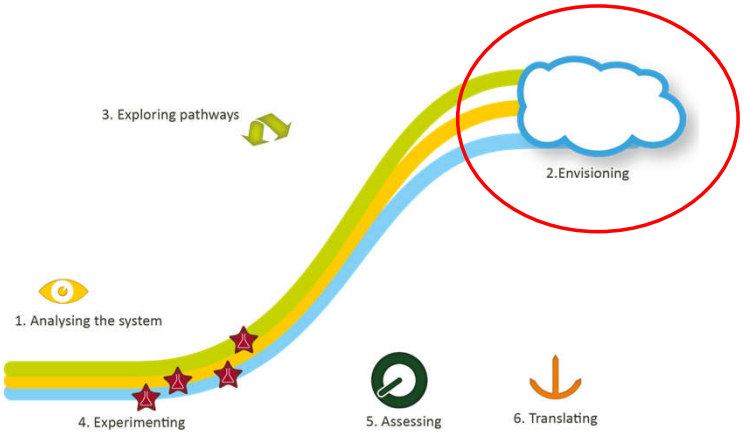
Iceberg model, causal loop diagrams, …

See further



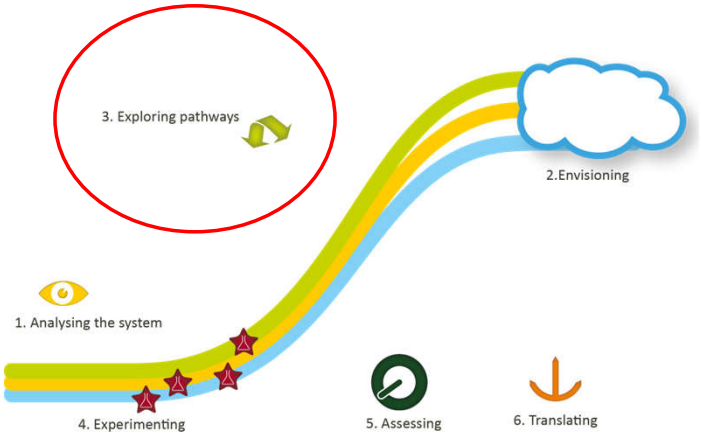
How could you manage or govern a transition

Envisioning : a change trajectory towards a more sustainable society or system is mainly initiated by an appealing and inspiring vision of a desirable future. A vision entails clear images/narrative of desirable systems based on shared principles of sustainable development. Inspiring visions replace 'having to' by 'wanting to', 're-active' by 'pro- active' and 'creative'. Visions are developed in carefully composed 'arenas' of engaged, creative and visionary frontrunners. Not he vision 'an sich'

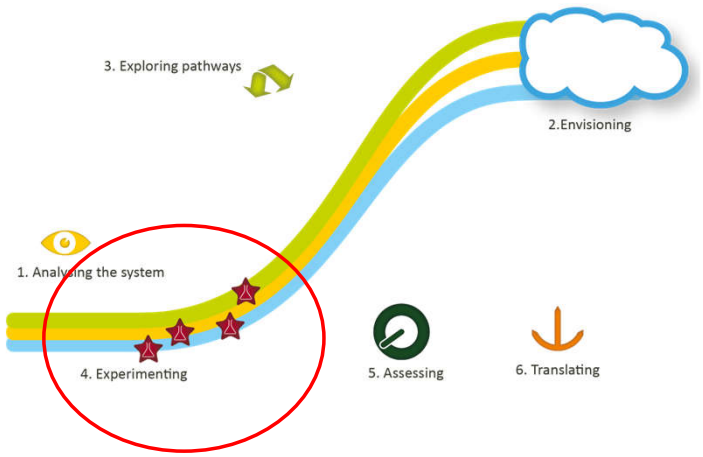


How could you manage or govern a transition

Exploring pathways: starting from an inspiring and clear vision, different strategies to realise a desired societal system configuration can be outlined. This 'back casting' exercise results in a number of strategic pathways that contribute to reaching the desired system configuration. **Models/scenarios can assess and underpin the effectiveness and feasibility of alternative pathways and the alignment of envisaged or on-going actions.**

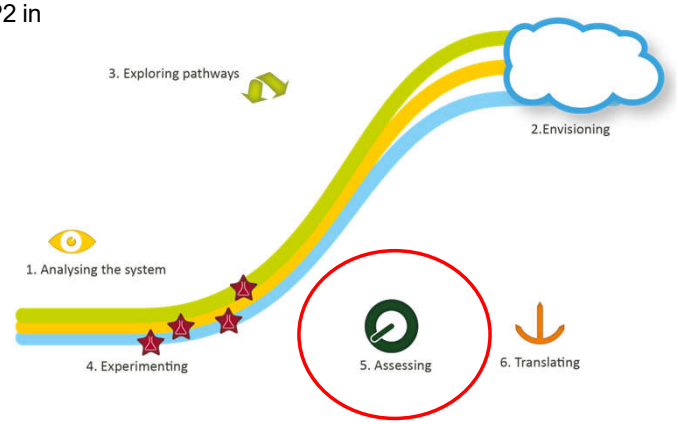


How could you manage or govern a transition

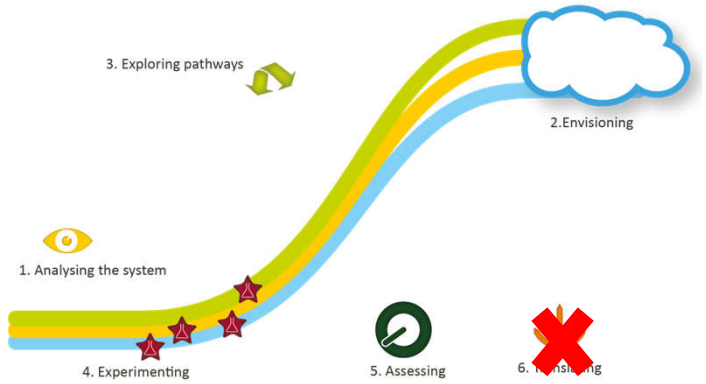


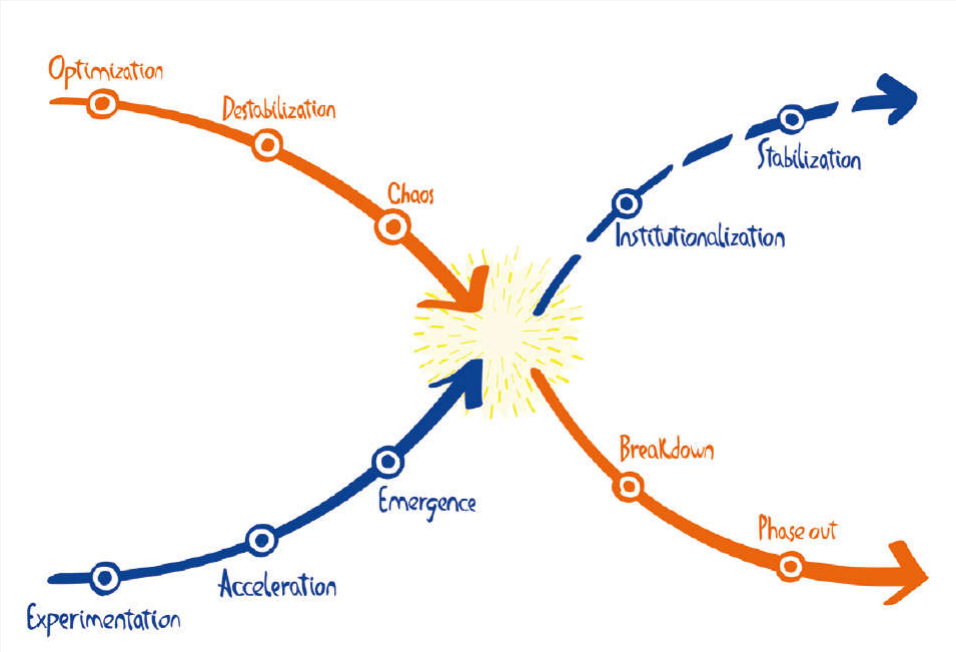
How could you manage or govern a transition

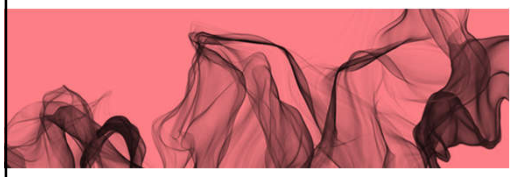
Assessing: to be developed under WP2 in this specific context



How could you manage or govern a transition







TRANSITIONS AND SYSTEMS

THINK ABOUT IT

‘There are many nexuses, but the essence is in the ‘Nexus-thinking’

Tafadzwa Mabhaudhi

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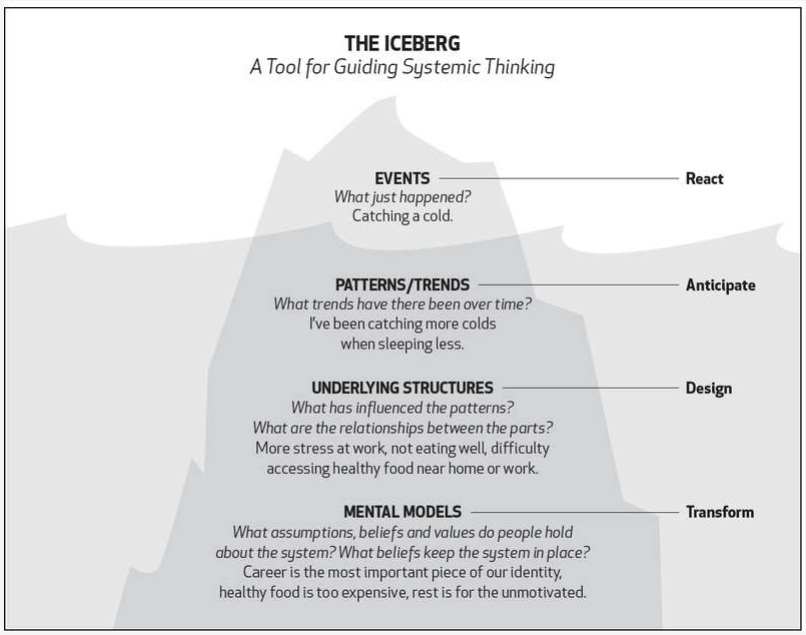
Simple as 1 – 2 – 3 …

Man announces he will quit drinking by 2050

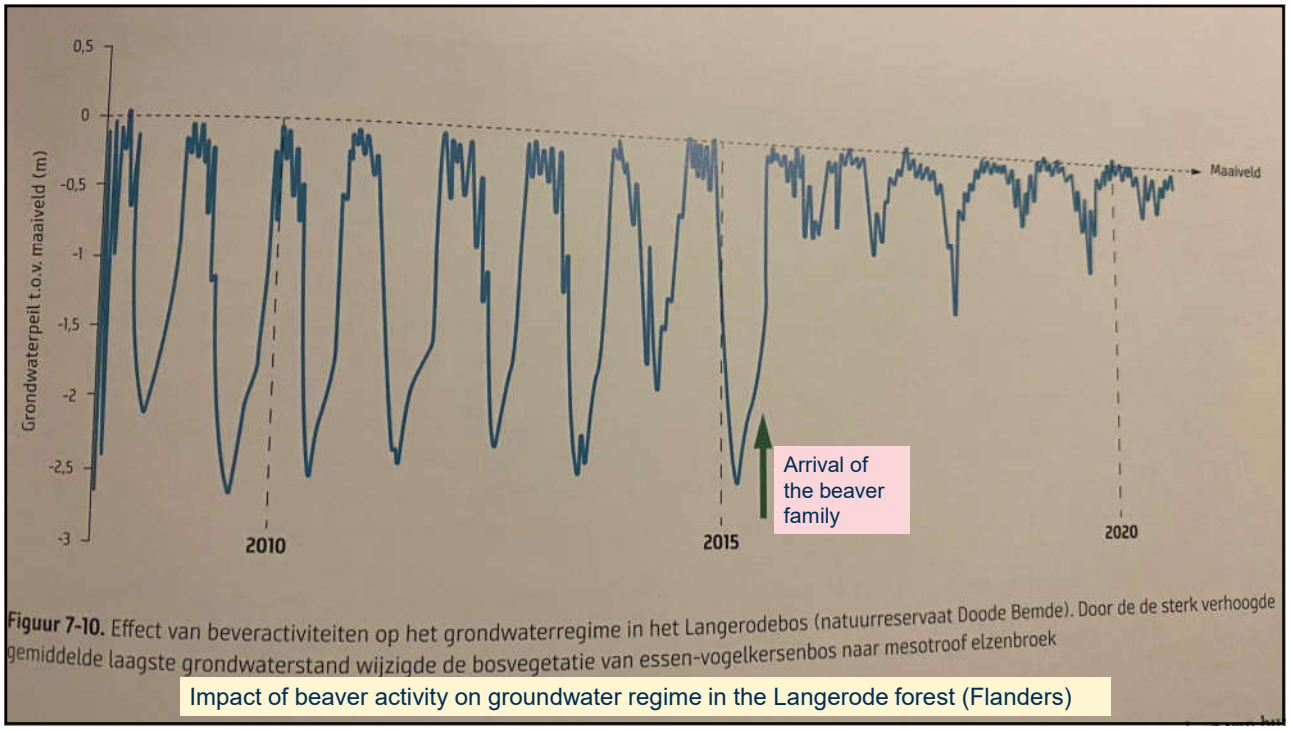
A Sydney man has set an ambitious target to phase out his alcohol consumption within the next 28 years, as part of an impressive plan to improve his health.

The program will see Greg, 73, continue to drink as normal before reducing consumption in 2049 when he turns 101. Taylor said it was important not to rush the process: "It's not realistic to transition to zero alcohol overnight. This requires a phased approach", he said, adding that whisky drinkers were the real problem. Greg is lobbying for additional investments in beer to maintain beer supply-chain security.

Greg will be able to bring forward drinking credits earned from the days he hasn't drunk over the past forty years, enabling him to reach net-zero but keep drinking. To assist with the transition, he has bought a second beer fridge which he describes as the 'capture and storage' method. He is also investing in direct alcohol extraction from blood technology.



Intuitive systems thinking: triangles



Figuur 7-10. Effect van beveractiviteiten op het grondwaterregime in het Langerodebos (natuurreservaat Doode Bemde). Door de de sterk verhoogde gemiddelde laagste grondwaterstand wijzigde de bosvegetatie van essen-vogelkersenbos naar mesotroof elzenbroek

Impact of beaver activity on groundwater regime in the Langerode forest (Flanders)

What kind of models would lead to advising the introduction of a certain species of animal in one of the bassins?

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Welcome again!!

Ready for day 2?

We are!

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What sticked to you from yesterday after a good night's sleep?

What are important things from yesterday's reflection, that we should keep in mind today?

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Using different lenses to look at a complex problem
Interconnectivity between issues (integrated lens)
Looking back and looking forward
Connecting past and future
Bringing in the voice of the new generations
Participation process itself
Value of collective envisioning
Limits of extending of what we have now
Interbassin water exchange, food sovereignty, free energy
Values of the WEF
Multilevel lens
Acceleration to stabilization
Innovation -> change -> related challenges -> opportunities
DREAM!! Create a bank of ideas.
Make more use of technologies for societal value creation
L' approche de travail qui develope une collective intelligence,
Better understanding of link between energy and agriculture
Image of the future developed by youngsters
Desire of the students of attaining food sovereignty
Idea of free energy opens a societal debate on responsibility of resources (power of techno economic thinking versus power of social change
Need to inforce the voice of the young
Value conflict and value trade off?
Move from sharing water to sharing benefits
Iceberg model, simple as 1-2-3, circles in the sky
Think about next steps in an integrated way
Keep our values top of mind
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Revisiting values

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What value(s) do we expect a sustainable water-energy-food-nexus to deliver to society?

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What do our values mean for WEF in Ghana and Burkina Faso?

- Break out-

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‘There are many nexuses, but the essence is in the ‘Nexus-thinking’

Tafadzwa Mabhaudhi

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Annex 2 – Modelling presentation

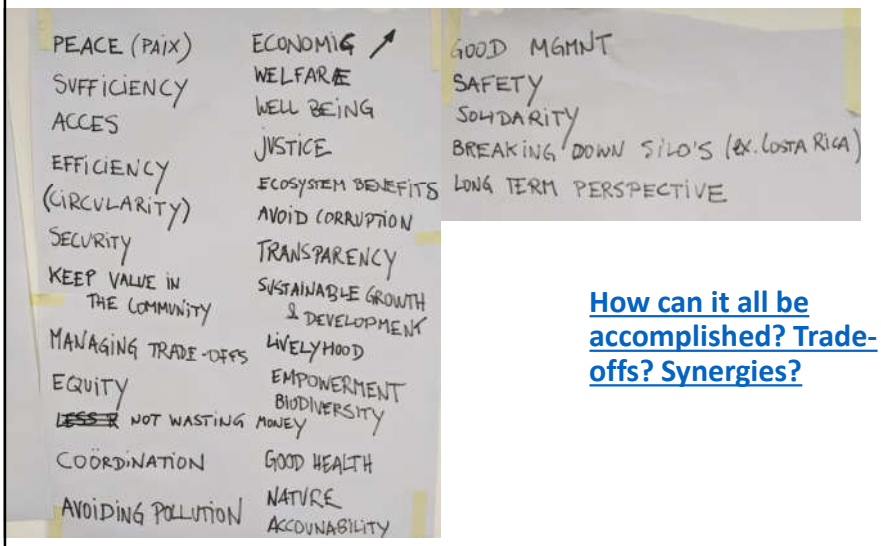
EPIC AFRICA's Work Package 4 – interacting with the Transition Space in Modelling for Insights (not answers)

WEF Investment Planning and Optimisation Model

Viktoria Martin, Shravan Kumar, Shreyas Savanur

KTH

Our desired "values" from the WEF



How can it all be accomplished? Trade-offs? Synergies?

Trade-offs and synergies in the ”WEF-NEXUS”

Security of supply is desirable!

- **Water Security:** *“The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.”* (UN Water: https://www.unwater.org/publications/water-security-infographic/)

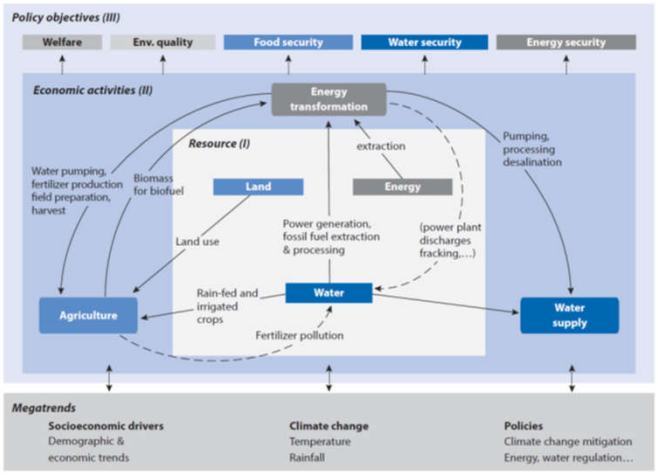
- **Energy Security:** *“uninterrupted physical availability at a price which is affordable, while respecting environmental concerns”* (IEA: https://www.iea.org/areas-of-work/ensuring-energy-security)

- **Food Security**: *“when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”* (UN FAO: http://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf)

How can ”security” be accomplished, in overall? Trade-offs? Synergies?

WEF-interlinkages

Figure 1.1. **Main linkages within the land, water and energy nexus**



OECD, The Land-Water-Energy Nexus, 2017
https://doi.org/10.1787/9789264279360-en

Why should we model?

- Governments and the public have **qualitative** ideas on the future development of the country and its energy system, for example:
  - Policy goals (e.g. economic development, financial constraints, environmental constraints, energy security, rural development …)
  - Preferred technology options (e.g. using domestic resources, increasing RES shares…)
  - Future availability and prices of energy forms…
  - Public perception: may prefer some technologies over others
- With mathematical models, it is possible to assess implications of different energy policy / development options on the resources management and sustainable development.

Why should we model?

- Sectors compete for resources …
- … resources under stress are especially vulnerable
- To accomplish security for all, we have to understand interlinkages and challenges!



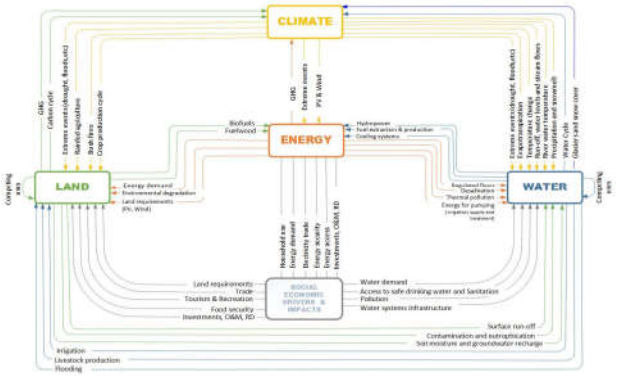
- Models cannot predict the future!
  - But can help understand the future better and stay prepared to take informed decisions
- Models cannot make decisions!
  - But aids in evaluating options and provide clear inputs for decision makers
- ***"Modelling for INSIGHTS, not numbers…"*** **(nor answers)**

Huntington et al, 1982

In addition, Climate Change is affecting the WEF NEXUS

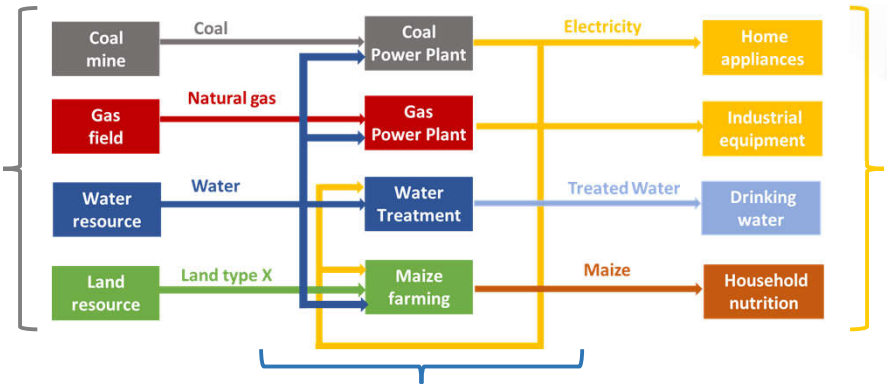
The CLEWs framework

- For quantifying the Land-Energy-Water nexus and its relation to Climate
- developing an integrated accounting model (resources use factors, adding CLEWs elements to sectoral models);
- with the development of sectoral systems models and integration and iteration between these;
- using a single modelling tool (here, OSeMOSYS)



CLEWs model -- a schematic

Inventory of resources



Describing the demand

Sector related conversion and distribution activities

Main input and outputs

Inputs

- Demands
- Demand profiles
- Transformation processes
  - Efficiencies
  - Costs
    - Capital
    - Fixed and O&M
  - Emissions
- Resources
  - Availability
  - Potential
- Energy storage
  - Costs
  - Potentials

Long-term Planning Model
(2063 :-))

Cost optimisation model

The objective is to minimise overall system costs given some constraints like:

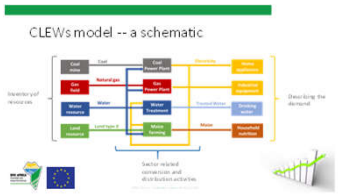
- Resource availability
- Resource potentials
- Emission limits
- Cost limits
- Meeting specific targets (20% electricity from renewables)

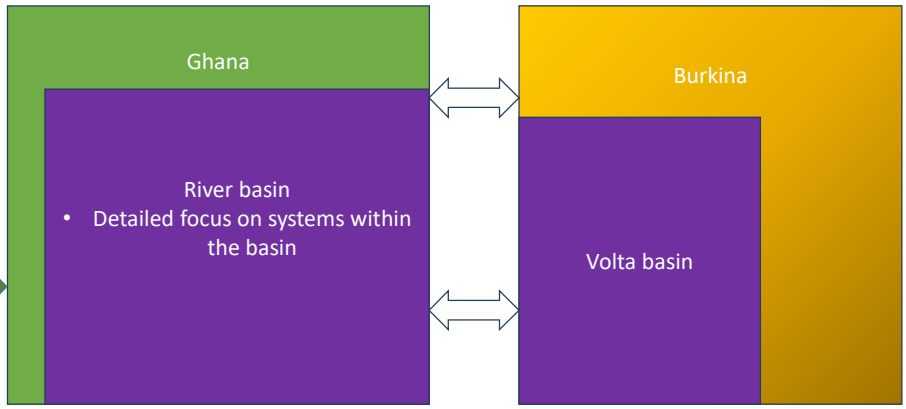
Scenario

Outputs

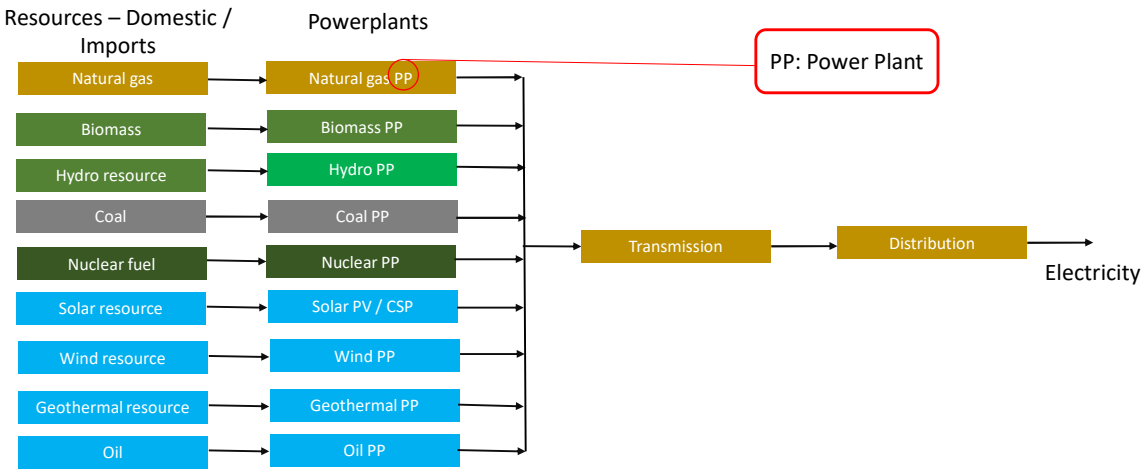
- Cost optimal Investment planning
- Supply mix for different commodities
  - Energy
  - Water
  - Food
- Commodity supply and demand balances
- Emissions and emission-related costs
- Costs
  - Investment costs
  - Operating costs
- Energy storage
  - Investment capacities
  - Operation

Model overall structure in EPIC Africa

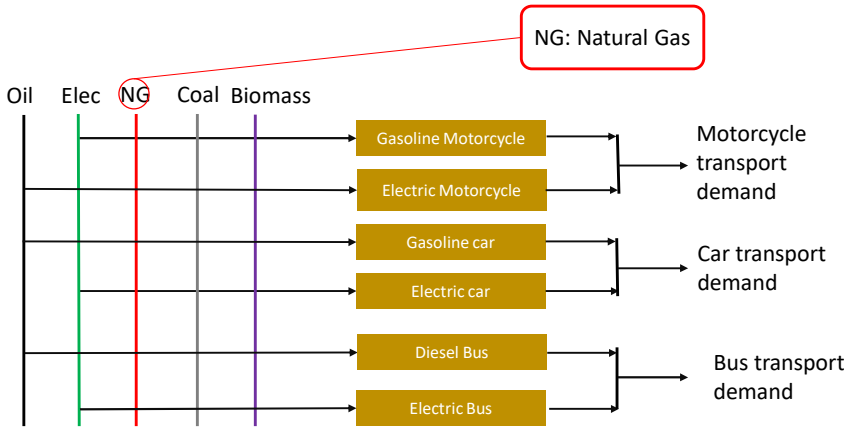




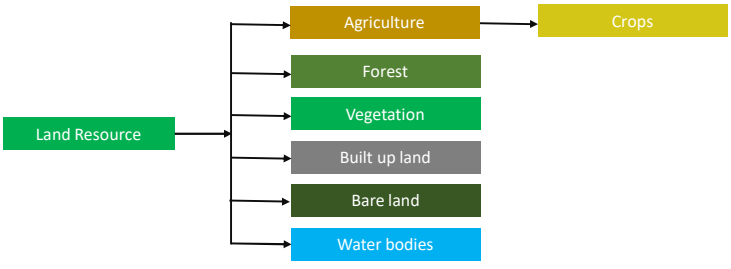
Example Model Part – the Electricity system



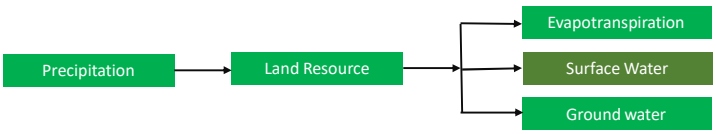
Example Model Part – the Transport system



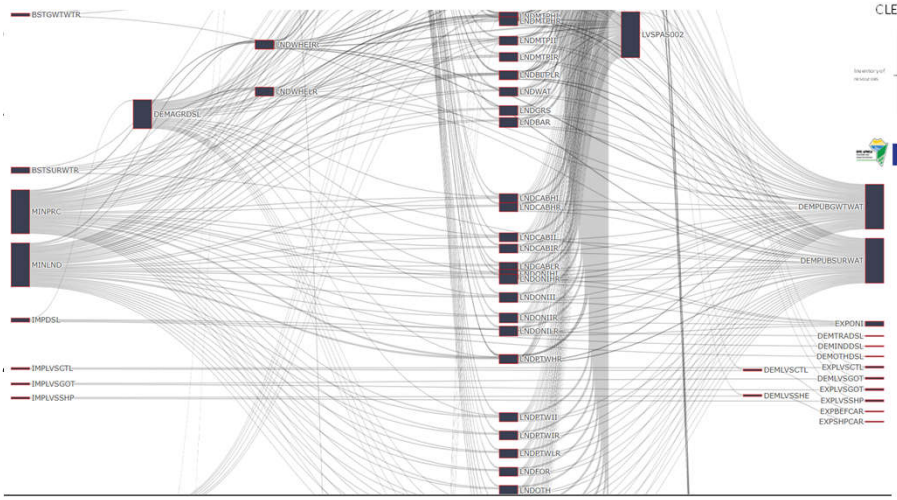
Example Model Part -- "Simplified" Reference for Land System

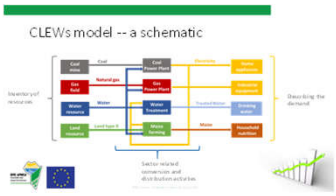


Example Model Part -- “Simplified” Reference for Water System

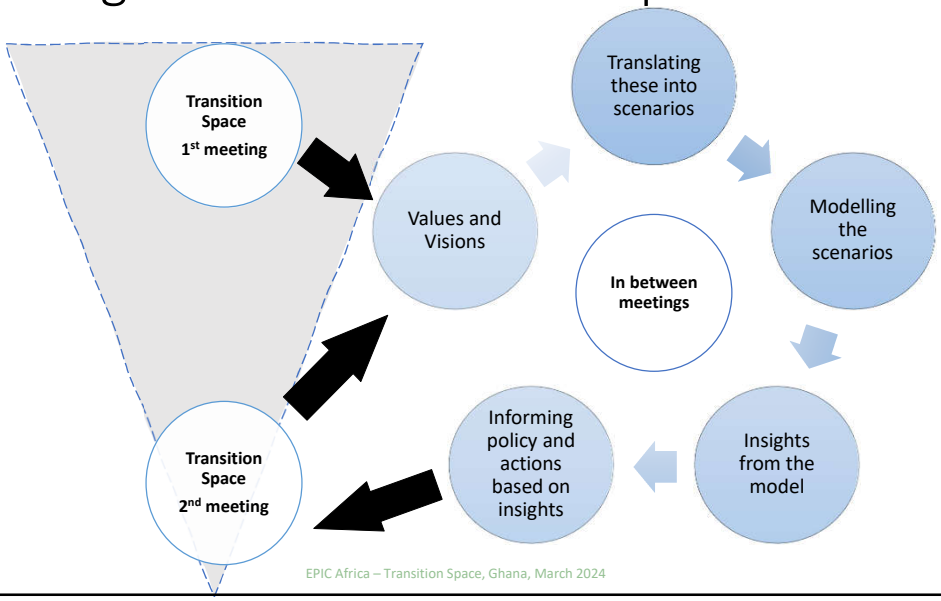


CLEWs model – the case of Namibia



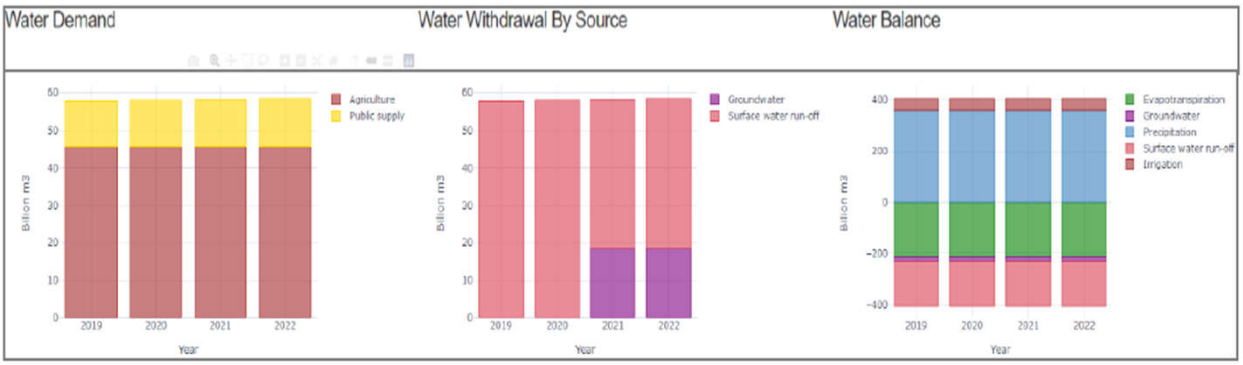


What insights should the model provide?

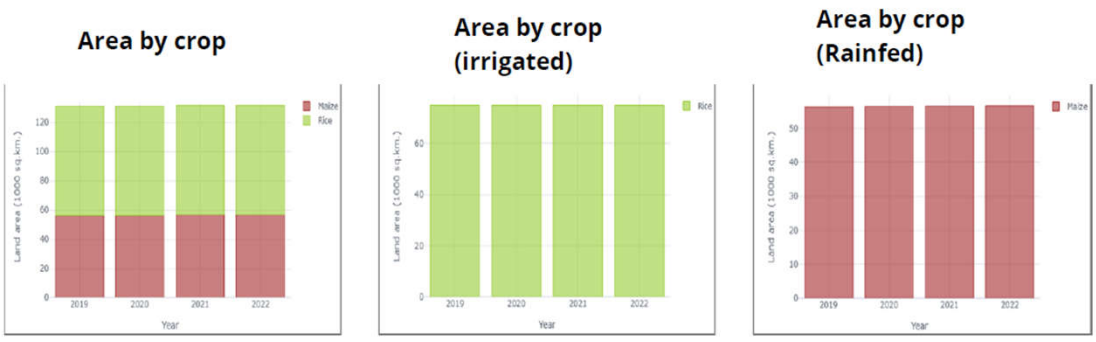


What insights are expected from the model?

Simple results from the model

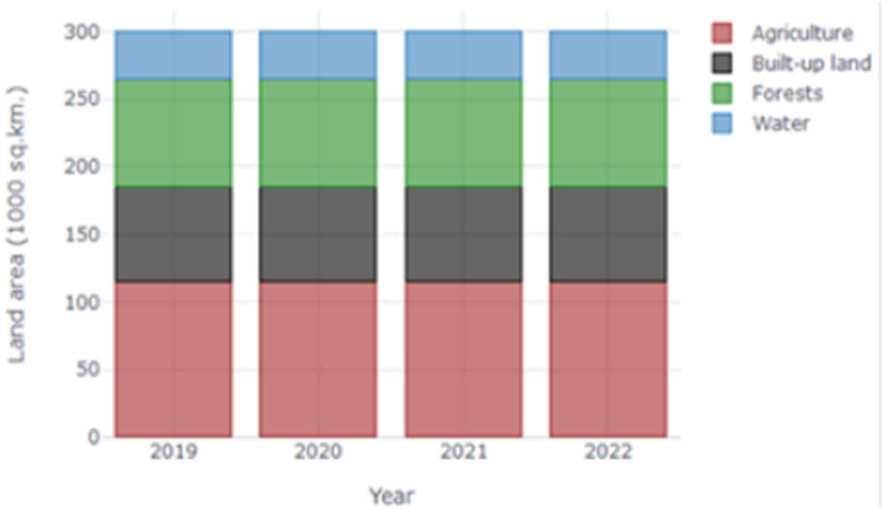


Simple results from the model



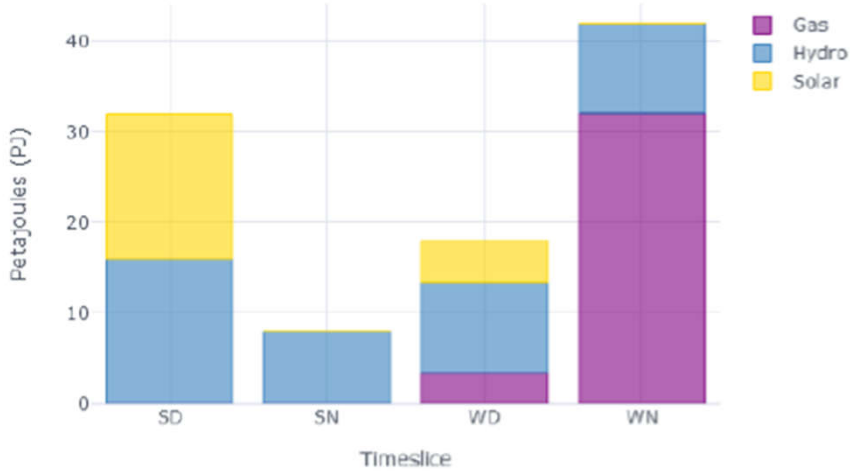
Simple results from the model

Land Use



Simple results from the model

Power Production

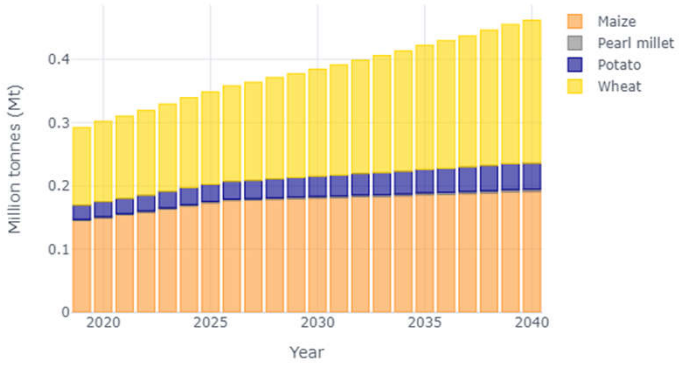


Insights from the Namibia model

"food for thought"

With the assumptions made for costs of domestic production and prices of grain imports, **imports are more convenient** than domestic production for wheat and potatoes, while **domestic production of maize** takes increasing share of demand increase.

However, if the costs of domestic production decrease and import prices increase, this could change.



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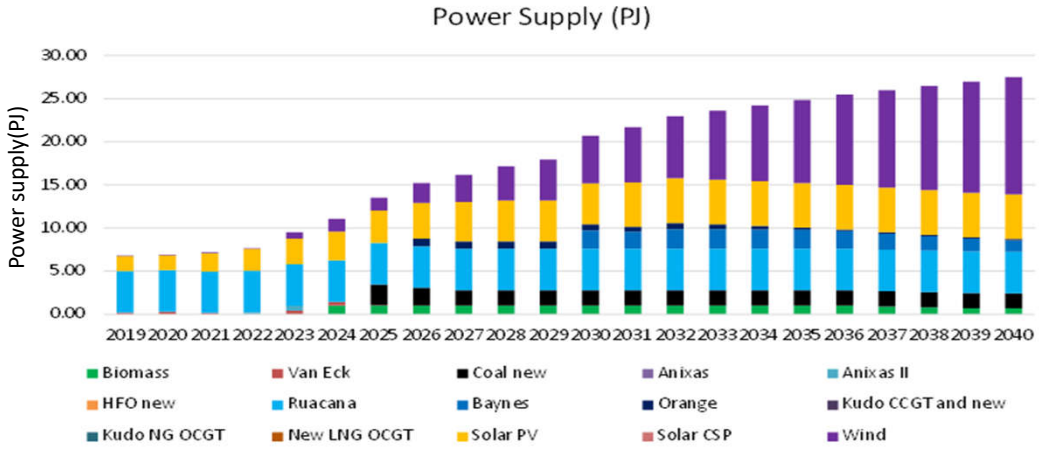
Insights from the Namibia model

"food for thought"



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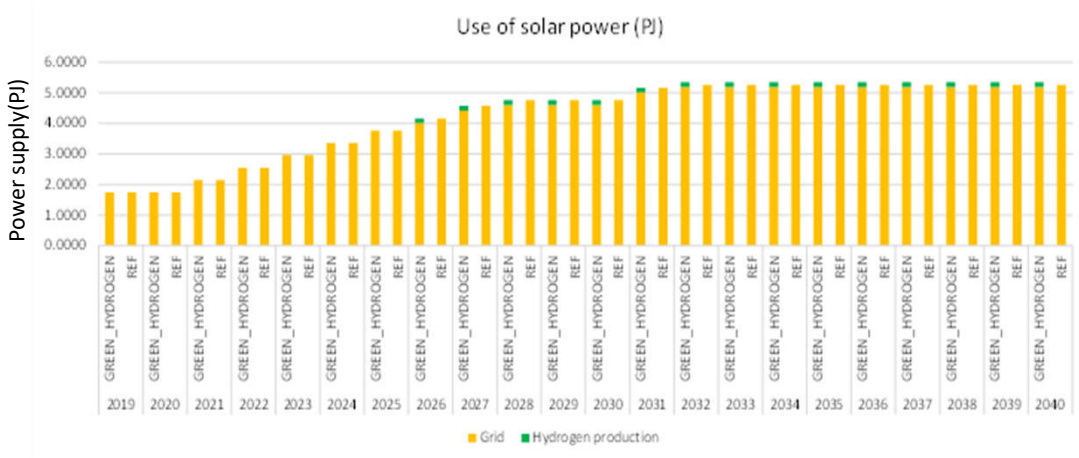
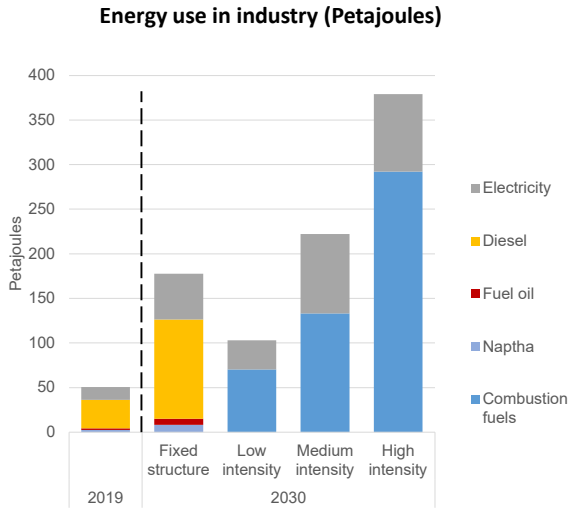
Insights from the Namibia model

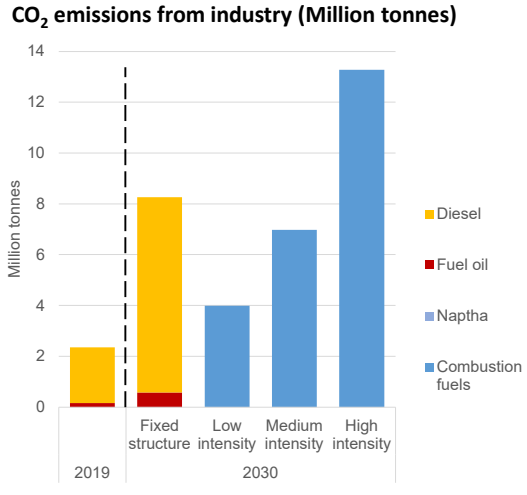
"food for thought"



Manufacturing sector, Namibia:

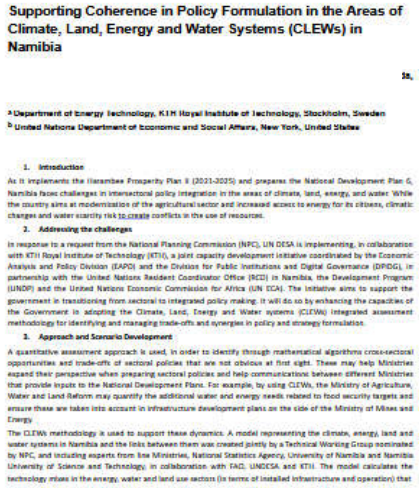
Scenarios for industrial development - "food for thought"





Insights from the Namibia model

"food for thought"



Supporting Coherence in Policy Formulation in the Areas of Climate, Land, Energy and Water Systems (CLEWs) in Namibia

[a], [b]

[a] Department of Energy Technology, KTH Royal Institute of Technology, Stockholm, Sweden
[b] United Nations Department of Economic and Social Affairs, New York, United States

1. Introduction

As it implements the Harambee Prosperity Plan II (2021-2025) and prepares the National Development Plan 6, Namibia faces challenges in intersectoral policy integration in the areas of climate, land, energy, and water. While the country aims at modernization of the agricultural sector and increased access to energy for its citizens, climatic changes and water scarcity risk to create conflicts in the use of resources.

2. Addressing the challenges

In response to a request from the National Planning Commission (NPC), UN DESA is implementing, in collaboration with KTH Royal Institute of Technology (KTH), a joint capacity development initiative coordinated by the Economic Analysis and Policy Division (EAPD) and the Division for Public Institutions and Digital Governance (DPIDG), in partnership with the United Nations Resident Coordinator Office (RCO) in Namibia, the Development Program (UNDP) and the United Nations Economic Commission for Africa (UN ECA). The initiative aims to support the government in transitioning from sectoral to integrated policy making. It will do so by enhancing the capacities of the Government in adopting the Climate, Land, Energy and Water systems (CLEWs) integrated assessment methodology for identifying and managing trade-offs and synergies in policy and strategy formulation.

3. Approach and Scenario Development

A quantitative assessment approach is used, in order to identify through mathematical algorithms cross-sectoral opportunities and trade-offs of sectoral policies that are not obvious at first sight. These may help Ministries expand their perspective when preparing sectoral policies and help communications between different Ministries that provide inputs to the National Development Plans. For example, by using CLEWs, the Ministry of Agriculture, Water and Land Reform may quantify the additional water and energy needs related to food security targets and ensure these are taken into account in infrastructure development plans on the side of the Ministry of Mines and Energy.

The CLEWs methodology is used to support these dynamics. A model representing the climate, energy, land and water systems in Namibia and the links between them was created jointly by a Technical Working Group nominated by NPC, and including experts from line Ministries, National Statistics Agency, University of Namibia and Namibia University of Science and Technology, in collaboration with FAO, UNDESA and KTH. The model calculates the technology mixes in the energy, water and land use sectors (in terms of installed infrastructure and operation) that

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- → We are here to listen, and capture insights on most important dynamic relations between resources systems and their interaction with users.
- → We will document our perception and report back the model design to TS for comments and feedback.
- → Model output will be presented to TS for enriching the discussion, and feedback on further model development.

The EPIC Africa project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101083763.

What insights are expected from the model?