



IRRP: Building Resilience in Tanzania's Energy Sector Planning



Authors

Maya Bruguera,
Molly Hellmuth, *ICF*
(molly.hellmuth@icf.com);
David Yates,
*University Corporation for
Atmospheric Research*



Aim of the project

The **USAID Integrated Resource and Resilience Planning (IRRP)** project supported Tanzania's national power utility, the **Tanzania Electric Supply Company Limited** (TANESCO), to develop a Power System Master Plan (PSMP) built around a 'least-regrets' power resource investment portfolio that is more resilient to long-term risks, including climate impacts. To identify this portfolio, the project used the IRRP framework. IRRP is a strategic power system planning approach. It builds off of traditional least-cost resource planning by using scenario analysis to identify and prioritise a least-regrets portfolio that best meets priority objectives across a broad range of potential futures. This case study focuses on the use of IRRP to integrate climate change risks and resilience considerations into power system planning, with a particular emphasis on the risk of drought to hydropower.



Dates

July 2015–April 2018



Countries

Tanzania



Participants coming together for the project's Climate Risk and Resilience Workshop. (Source: ICF, 2017)

Aim of co-production:

The co-production aimed to support the development of a power systems master plan by leveraging climate science and TANESCO's local knowledge to:

- develop and validate the results of a climate risk assessment of Tanzania's power sector;
- prioritise climate risks facing TANESCO's power system;
- develop a scenario for the highest priority climate risk ('drought scenario') for inclusion in the power sector modelling;
- assess the sensitivity of different power sector investment portfolios to the drought scenario against a range of performance metrics;
- identify adaptation measures to address climate risks associated with the selected least-regrets portfolio; and
- increase TANESCO's awareness of climate risks and capacity to address these risks in power system planning.

The co-production method promoted sustained interactions of project stakeholders over time in order to effectively integrate TANESCO's knowledge of climate impacts into the project. The method embraces uncertainty in climate information, and focuses users on identifying power sector investments and adaptation measures that address critical risks.

Context:

Co-production was done at the level of the project, which involved the development of a national scale power investment plan. Co-production was critical in undertaking Integrated Resource and Resilience Planning and developing the least-regrets power resource portfolio for the Power System Master Plan. Leveraging TANESCO's knowledge of past climate impacts and the relative magnitude of these impacts on the power system enriched the findings of the power sector climate risk assessment. In addition, TANESCO prioritised a core set of climate risks to include in the power sector master plan, and to incorporate into the sensitivity analysis. TANESCO rated the performance of different potential power sector investments against a broad range of system performance metrics, such as climate change emissions, reliability under drought and cost, in order to identify the least-regrets portfolio. Additionally, the repeated collaboration between climate experts and TANESCO helped heighten the power provider's awareness of how climate change might impact their system and advanced their capacity to consider these risks in the future.

Who was involved and what was their role?

The IRRP project brought together a range of stakeholders, including power sector stakeholders from TANESCO, and power sector, water and climate change experts from ICF, and the Stockholm Environment Institute (SEI). ICF led the co-production activities, arranging the meetings and working sessions with TANESCO. USAID-IRRP led the co-production of the climate projections and impact information in collaboration with TANESCO. Similarly, USAID-IRRP held workshops, working sessions and training sessions with TANESCO, which led to validating the climate risks, adaptation responses and the results of the WEAP-Tanzania model.

How was co-production done?

Co-production was undertaken through a formal partnership between the USAID-IRRP project and TANESCO. In addition, the project engaged a broader set of stakeholders – including the Ministry of Water – to raise awareness of climate change implications for hydropower and agricultural water use.

What was co-produced?



- **A Power Sector Master Plan:** A long-term, least-regrets, power sector master plan, which includes climate risk and resilience considerations, was co-produced.
- **A report on climate risk and resiliency in the Tanzanian power sector:** The report includes climate change risks to, and adaptation options for, power generation, transmission and distribution, and demand at a sub-national scale.
- **A future drought scenario:** The scenario is for use in the IRRP scenario analysis to test the different investment portfolios' resilience to drought.



Benefits of the co-production approach

- Co-production resulted in integrating climate change risks into long-term power sector planning and decision-making.
- Translating climate information into climate risks to the power sector was key in engaging stakeholders and enabling the co-production process.
- The co-production components that were most useful were the climate data development and multi-stakeholder interpretation and validating. These processes enabled stakeholders to communicate local knowledge of climate risk and their climate resilience priorities.
- Collaborating with key power sector stakeholders resulted in a plan that is: (i) informed by potentially broader and more robust data, information, and insights; (ii) has greater buy-in from key stakeholders; and, (iii) instils confidence in investors that the country has a collective strategy.

In the context of the IRRP project, co-production is the production of knowledge about climate risks through a partnership of climate experts (USAID-IRRP), water resources managers, and power sector stakeholders and decision-makers (TANESCO). USAID-IRRP produced the climate information and translated it into decision-relevant information on risks for the power sector decision-makers. USAID-IRRP then collaborated with TANESCO to prioritise climate risks facing the power sector, and to assess the different power sector investment portfolios' sensitivity to drought, the top-priority risk. Engagement took place through intensive working sessions in Dar es Salaam, and through regular email and phone communications.

Co-develop solutions

- **Climate data development:** USAID-IRRP translated historical and projected climate change information into potential impacts to the power sector, then worked with TANESCO, who identified drought as the most critical risk. USAID-IRRP developed a future drought scenario based on historical daily re-analysis data, and developed the WEAP-Tanzania model to assess the impact of climate change on hydropower production.
- **Multi-stakeholder interpretation, validation:** USAID-IRRP developed a report outlining climate change risks to generation, transmission, distribution and demand at a sub-national scale, as well as potential adaptation responses to these risks. USAID-IRRP collaborated with TANESCO to validate these results, prioritise the risks and identify and evaluate potential adaptation responses. After developing the three investment portfolios, TANESCO evaluated the sensitivity of each one to drought based on their performance against fuel security and reliability, cost, greenhouse gas emissions, and other metrics.
- **Communication:** USAID-IRRP trained TANESCO staff, including hydropower managers and others, on the WEAP-Tanzania model. USAID-IRRP also used intensive working sessions to communicate findings on climate risk and build capacity for assessing and developing adaptation options to address climate risks.

Evaluate

The evaluation of investment portfolio sensitivity to a range of risks, including climate change, informed the choice of a least-regrets power sector master plan. The least-regrets plan allows stakeholders to assess the importance of power system resilience to changing circumstances and unexpected events relative to a least-cost plan which focuses solely on system cost. The least-regrets plan is a foundational element in enabling greater investment in the power sector, which is necessary to advance Tanzania's economic development.

Lessons to learn from:

- **Establishing relationships and buy-in takes sustained effort and time:** Given that project consultations compete with other stakeholder priorities and activities, consultations must be designed to be efficient and maximise opportunities for stakeholders to provide critical feedback and insight. Extensive and regular consultations allowed for the development of relationships, significant co-production of strategies and solutions, and an integrated power systems master plan. At the same time – in part due to competing priorities – stakeholder engagement was, at times, challenging, over the duration of the project.
- **Co-production of useful climate information was undertaken through the lens of decision-relevant climate impacts to the power sector:** Stakeholders were most interested and engaged in discussions surrounding climate impacts, and avenues to address these impacts. Stakeholders identified with the idea that future climate impacts to the power sector may change, given the changes they have already experienced.
- **Integration of co-produced climate information into existing planning approach was helpful:** Power sector planners were more engaged because the Power System Master Plan development was demand-driven and because climate change risk was just one of many risks taken into consideration in the power planning process. The IRRP process is flexible, replicable and is currently being applied in other contexts, notably in Ghana.

REFERENCES

Hellmuth, M.E., Bruguera, M. and Potter, J. (2017) 'Risks and resiliency in the Tanzania electric power sector'. New York: ICF. (https://www.climatelinks.org/sites/default/files/asset/document/2017_RALI_Addressing%20Climate%20Vulnerability%20for%20Power%20System%20Resilience%20%26%20Energy%20Security_Hydropower%20White%20Paper.pdf).