SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

IMPACT OF IEA SHC TASK 69 (Solar Hot Water 2030) IN THE SOUTHERN AFRICAN REGION

Samson Mhlanga - National University of Science and Technology (NUST) Zimbabwe

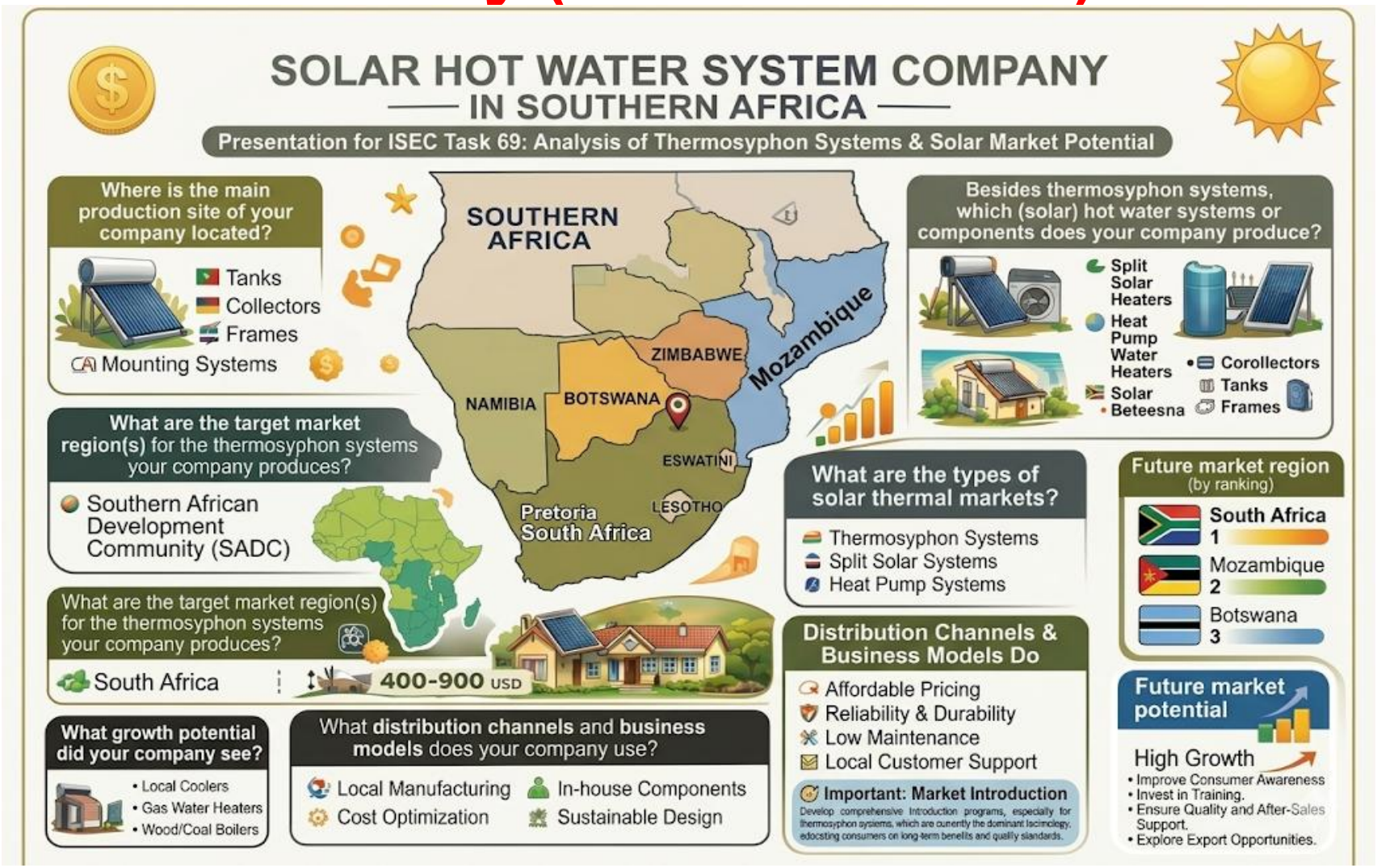
Subtasks

- Subtask A: State-of-the-art and operating environments in different regions
- Subtask B: Thermosyphon hot water systems
- Subtask C: Solar Photovoltaic Hot Water
- Subtask D: Training and standards

Subtask A: State-of-the-art and operating environments in Southern Africa Region

- Hot water load
- Installed technologies & common back up fuels used
- Identify the best solar technologies for SHWs regions and their barriers to adoption (technological, economic, social).
- Review system configurations for best practice
  - Thermosyphon
  - Smart tanks
  - PV hot water (PV2Heat & PV diverters)
  - Other emerging and ancillary components for the above
- Identify the technical and economic potential for each technology/ system design in relevant regions around the globe

Market Survey (Subtask A extract)



AI formulated Image from Market Survey

Improved market understanding and data for the region

- One of Task 69's biggest contributions has been **filling knowledge gaps** in Southern Africa's solar hot water (SHW) sector.
- Regional studies (e.g., SADC-focused work) mapped:
  - Existing SHW penetration
  - Technology types (thermosiphon vs PV hot water)
  - Market barriers and opportunities
- The Task created **comparative global datasets and benchmarks**, allowing Southern African markets to be evaluated against other regions
- 👉 **Impact:**
  Policymakers, utilities, and investors now have **better evidence for planning and scaling solar water heating** in the region.

Support for policy and market development

The Task contributes to:

- **Policy briefs and recommendations**
  - Identification of **barriers (technical, economic, regulatory)**
  - Input into **national solar thermal roadmaps**
  - Regional expectations included:
  - Better **price competitiveness**
  - Influence on **legislation and policy frameworks**

  Impact:

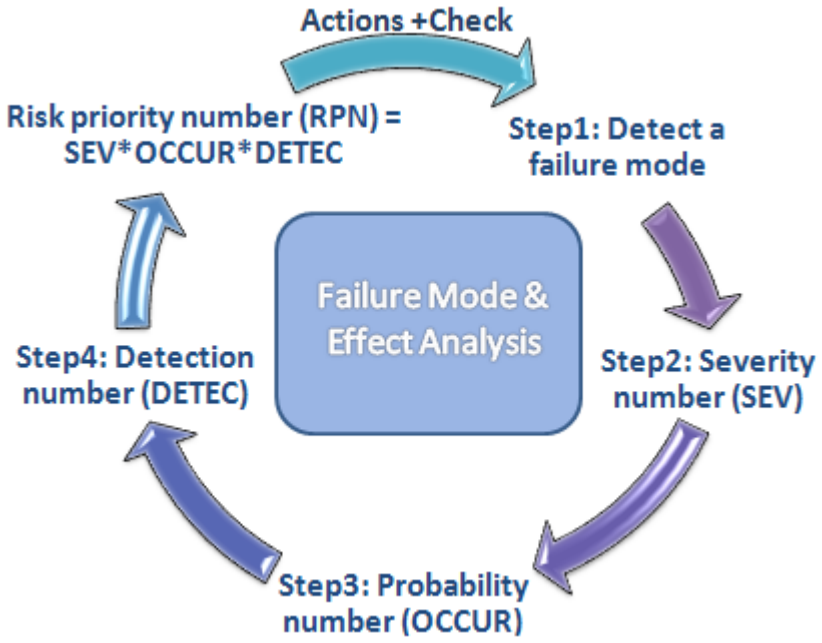
  Helps governments and institutions **design supportive policies and incentives**, though implementation depends on national action.
- Development of Solar Thermal Roadmaps and Bankability document in Zimbabwe, Botswana and Namibia

Subtask B: Thermosyphon hot water systems

- Objective
- Evaluate thermosyphon systems in terms of their technical and economic potential to ‘move the needle’ on renewable energy targets.
- The potential for improving performance of thermosyphons:
  - Convenience
  - Durability and reliability
  - Energy saving & carbon reduction calculation and testing
- Investigate emerging installation requirements (such as aesthetics)

IMPACT OF SUBTASK B: Failure Mode Effect Analysis (FMEA)

- Modes of Failures
  - Overheating of header tank/ assist



Impact of Design and Reliability of Systems in the Southern African region

Strong focus on low-cost, suitable technologies

- Task 69 prioritizes:
  - **Thermosiphon systems**
  - **PV-to-hot-water systems**
- These are especially relevant in Southern Africa because:
  - They are **low-cost and low-maintenance**
  - They work well in **high solar irradiance environments**
  - PV-resistance heating is already **popular in South Africa due to low capital cost**
- 👉 **Impact:**
  The Task has helped **validate and optimize technologies that are already well-suited to Southern African conditions**, accelerating realistic adoption pathways rather than importing unsuitable solutions.

Subtask C: Solar Photovoltaic Hot Water

- Evaluate the environmental, social and economic implications of the increased deployment of solar photovoltaic diverter and PV2Heat technologies.

- South Africa has lead in the PV2Heat Innovation by the Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University
- Namibia Energy Institute (NEI) has a comparative research setup between Evacuated Systems, Flat plate System, and PV2Heat, with data monitoring ongoing currently

Spotlight on the South African solar thermal market | Solarthermalworld

SOLTRAIN - Southern African Solar Thermal Demonstration and Training Initiative

https://www.iea-shc.org/article?NewsID=595

Subtask C: Solar Photovoltaic Hot Water: Impact on going Collaborative Research at Namibia Research Institute

Subtask C: Solar Photovoltaic Hot Water: Research at Stellenbosch University

- Beneficiary company: Private Hospital
- Location: Cape Town
- Application: Domestic Hot Water
- Collector Type: PV-Thermal
- Collector Area: 196 m2 (137 kW heat and 38kW electrical)
- Thermal Storage: (8 500l solar pre-heat and 4 500l supply)

- Beneficiary company: Affordable Housing Residents.
- Location: Gauteng, South Africa.
- Application: Water Heating, Lighting, and Device Charging.
- PV Capacity: 2-bedroom units: 2 × 550 W PV panels; 3-bedroom units: 3 × 550 W PV panels
- Thermal Storage: 150L per unit (9000 for overall development)

Subtask D: Training and standards

- Review of Quality Standards in Sub-Sahara Africa (including SOLTRAN partner countries,
  - Southern Africa Countries with National Standards
  - Zimbabwe, South Africa, Namibia
  - 13 Countries with no National Standards
- Participated in training needs surveys
- Undertaking Training session by Task 69 Experts, and SOLTRAIN+ project for installers, artisan, technicians, academic, engineers and energy professional Solar Energy Practitioners

The Solar Keymark
CEN Keymark Scheme

https://task69.iea-shc.org/article?NewsID=592
https://task69.iea-shc.org/news

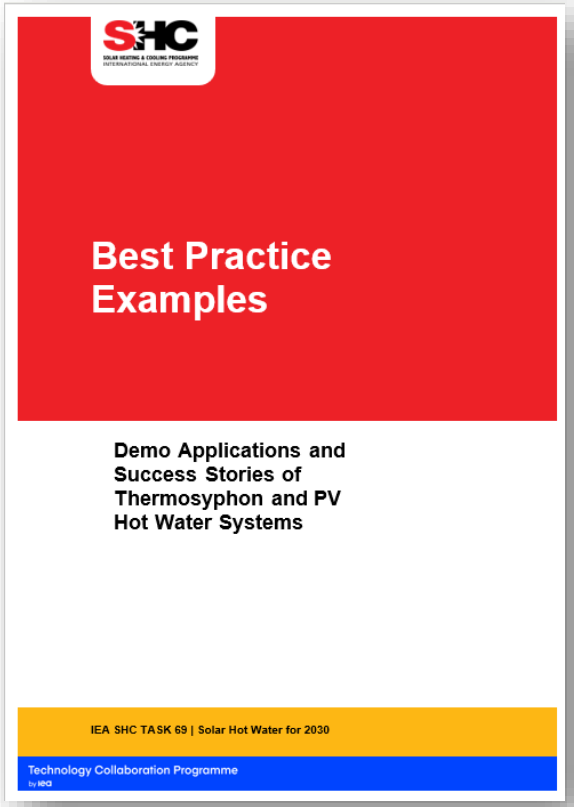
Quality improvement through standards & training

- A major issue in the region has been **poor installation quality and unreliable systems**.
- Task 69 addressed this by:
  - Developing **standards and certification frameworks**
  - Identifying **failure modes specific to the region** (e.g., water quality, installation errors)
  - Supporting **training programs and educational materials**
- Local stakeholders explicitly highlighted:
  - Need for **quality control**
  - Need for **trained installers and inspectors**
- 👉 **Impact:**
  Improved quality assurance → **higher consumer confidence and longer system lifetimes**, which are critical for market growth.

Capacity building and regional collaboration

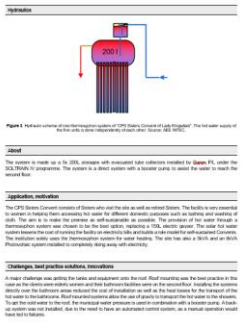
- Task 69 has been closely linked with regional initiatives like SOLTRAIN+ through:
  - Joint symposiums and training events in **Namibia (Windhoek)**
  - Creation of **expert networks across Southern Africa**
  - Exchange between **global experts and local practitioners**
- 👉 **Impact:**
  - Strengthened **regional expertise**
  - Built **local technical capacity**
  - Increased **knowledge transfer from global best practices**

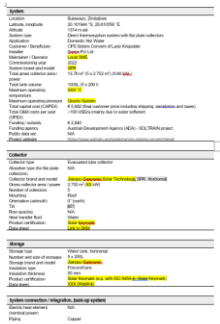
D A.2: Best practice examples



- Scope: **Thermosyphon Systems** and **PV Hot Water Systems**, limited to systems in operation (e.g., best practice in terms of performance-efficiency ratio, design, social aspects, etc.)
- **Template for thermosyphon system available!** (CPS Sisters Convent of Lady Kingsdale (Zimbabwe))
- **Aim:** 2-5 systems per region


4.7.1 CPS Sisters Convent of Lady Kingsdale (Zimbabwe)





Conclusion

- IEA SHC Task 69 has **not directly transformed the Southern African market yet**, but it has laid **critical foundations**:
  - Better data
  - Better technologies (adapted to local conditions)
  - Better skills and standards
- These are exactly the prerequisites needed for **scaling solar hot water adoption across the region in the coming decade**.

Acknowledgement

Funded by

Austrian Development Cooperation

Samson Mhlanga Soltrain+ Project – Zimbabwe Country Coordinator) samson.mhlanga@nust.ac.zw