SECCA
Sustainable Energy Connectivity in Central Asia

Funded by the European Union

The European Union – Uzbekistan: Sustainable Energy Days 2024

Workshop: Unlocking EU-CA Research Cooperation under Horizon Europe

Tashkent, 21 November 2024

Success story:

Hydro4U- Sustainable small-scale hydropower in Central Asia Project funded by Horizon 2020

Prof., Dr. Bakhtiyor Karimov

"Tashkent Institute of Irrigation and Agricultural Mechanization Engineers"

National Research University

Stantec | intec | ACTED | European University Institute | Robert Schuman Centre for Advanced Studies | FSR ENERGY Florence School of Regulation

Development history of “Hydro4U- Sustainable small-scale hydropower in Central Asia” Project funded by Horizon 2020

Horizon 2020 - Research and Innovation Framework Programme;

Call: H2020-LC-SC3-2018-2019-2020 (BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE:
SECURE, CLEAN AND EFFICIENT ENERGY)

Type of action: Innovation actions.

Proposal title: Hydropower For You **(Hydro4U)**

Preparation of project proposal as started in early 2020.

Evaluation Summary Report:

Total score: 14.50 (Threshold: 10; Maximum: 15);

Criterion 1 – Excellence: Score: **5.00**

Criterion 2 – Impact: Score: **5.00**

Criterion 3 - Quality and efficiency of the implementation: Score: **4.50**
Score: **4.50**

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Overview

Project Type:
Innovation Action

Consortium Partners:
10 from Europe, 3 from Central Asia

Total Budget:
~ 11.5 Mio. € (EU Contribution ~ 9.95 Mio. €)

Duration:
June 2021 – May 2026

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Objectives

- Develop, demonstrate, and assess two innovative European SHP technologies in CA;
- Optimize the climate resilience of SHPs by including climate change scenario analysis;
- Implement a GIS-based decision support system to enhance sustainable exploitation of SHP potentials;
- Develop a scalable Water Accounting System to share energy and agriculture benefits in a climate-sensitive manner under the WFEC nexus context;
- Support the competitiveness and market uptake of European SHP technologies and planning & assessment methods in CA;
- Enhance problem awareness and objectiveness of policymakers, implementers, NGOs, and the public.

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Impact

All in all, Hydro4U will contribute to the following impacts:

- Support the competitiveness of the European hydropower technology sector as a responsible actor in global markets in the long-term
- Promote the overall sustainability of the provided hydropower solutions within the Water-Food-Energy-Climate nexus in Central Asia
- Strengthen the worldwide leadership of the European hydropower industry in providing innovative and sustainable hydropower solutions
- Support international cooperation with developing countries to reach together the UN Sustainable Development Goals
- Increase energy security in remote areas
- Reduce carbon emissions
- Elaborate new standards that are both cost-efficient and sustainable
- Enhance the international cooperation with developing countries in terms of (scientific) knowledge exchange and technology support

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Project Structure

WP1 **Analysis of unexploited small hydropower potential** ***WP2***

Engineering:
Potential Calculation

Natural Sciences
Hydrology & Climate Change
Morphology and Ecology

Socio-Economics:
Water-Energy-Food-Climate-Nexus

WP3 **Development and Implementation of Innovative & sustainable SHP technology and methods** ***WP4***

Technology Development
Two technologies for low and for medium-head

Planning: Holistic approach including technical, economic, ecological and social aspects

Assessment: of performed methods and implemented technologies

WP5 **Replication, Dissemination & Exploitation** ***WP6***

Replication: Feasibility studies for further project development
Guidance and Decision Support

Dissemination
Communication of results
Capacity Building

Exploitation: Support commercialisation of developed technologies and methods

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Project Overview

Modular solution

The Hydro4U project will adapt European technologies to Central Asia, demonstrating viability in a forward-looking cross-border water-food-energy-climate nexus. Price competitiveness will be assured through design alterations based on a prior analysis of unexploited sustainable small-scale hydropower potential in Central Asia. Hydro4U will install and assess two demo plants: an eco-friendly low-head run-of-river plant and a medium-head plant, both with radically reduced planning and construction costs that do not compromise efficiency. These solutions will be fit-for-purpose based on innovation, and modularization, meaning a radically simplified structural concept, with longevity, eco-compatibility, and socio-political acceptance.

Replication in Central Asia

A replication model will be developed to address all small-scale hydropower potential in Central Asia. This will demonstrate EU quality standards and create entry points in developing markets for the entire European small-scale hydropower industry. This will be supported by a Web-based Decision Support System for sustainable exploitation of the hidden small hydropower potential in Central Asia to generate impact beyond the project.

Target Group

Hydro4U brings together industry, politics, science, and stakeholders from both Central Asia and the European Union to contribute to a sustainable and climate-resilient future for the region by demonstrating European small hydropower equipment and technologies. Close cooperation with hydropower actors and investors from both regions are an essential part of Hydro4U.

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Technologies: Shaft Power Plant

Application Range:

Modular low-head run-of-river power system with fish-friendly intake

Net Head:

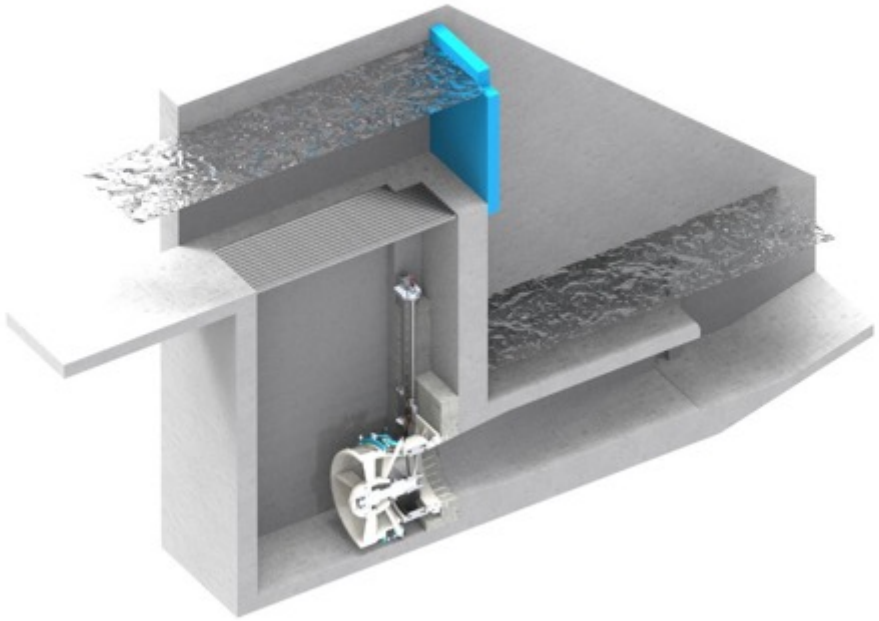
2 - 12 m

Discharge (per module):

1.5 – 20 m^3/s

Power output (per module):

20 kW – 2 MW



Funded by the European Union

Technologies: Francis Container

Application Range:

Standardised and modular medium head power solution

Net Head:

30 - 130 m

Discharge (per module):

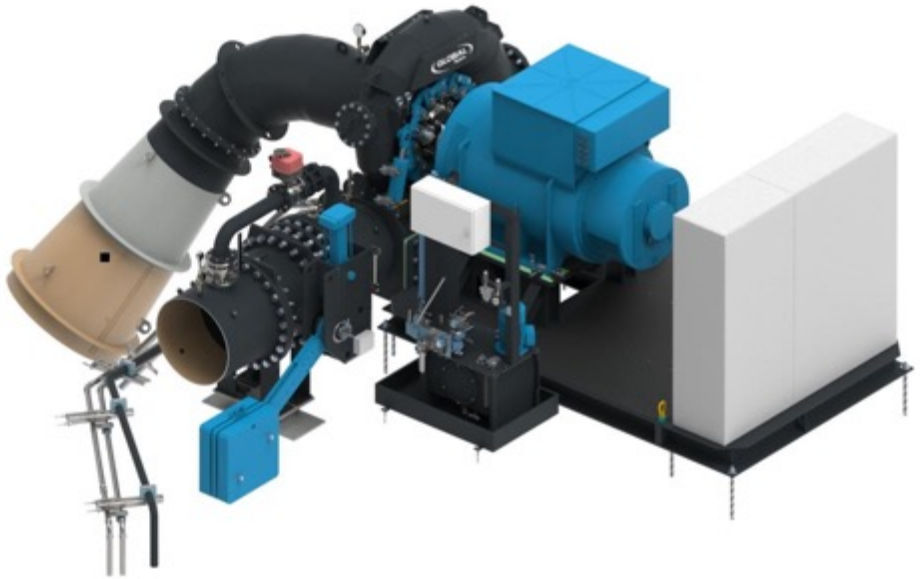
0.2 – 2.4 m^3/s

Power output (per module):

100 kW – 1 MW

Annual Energy Generation: 14000MWh

People supplied with electricity: 8500



Funded by the European Union

Tools & Methods: Electrofishing and Radiotelemetry

Funded by
the European Union

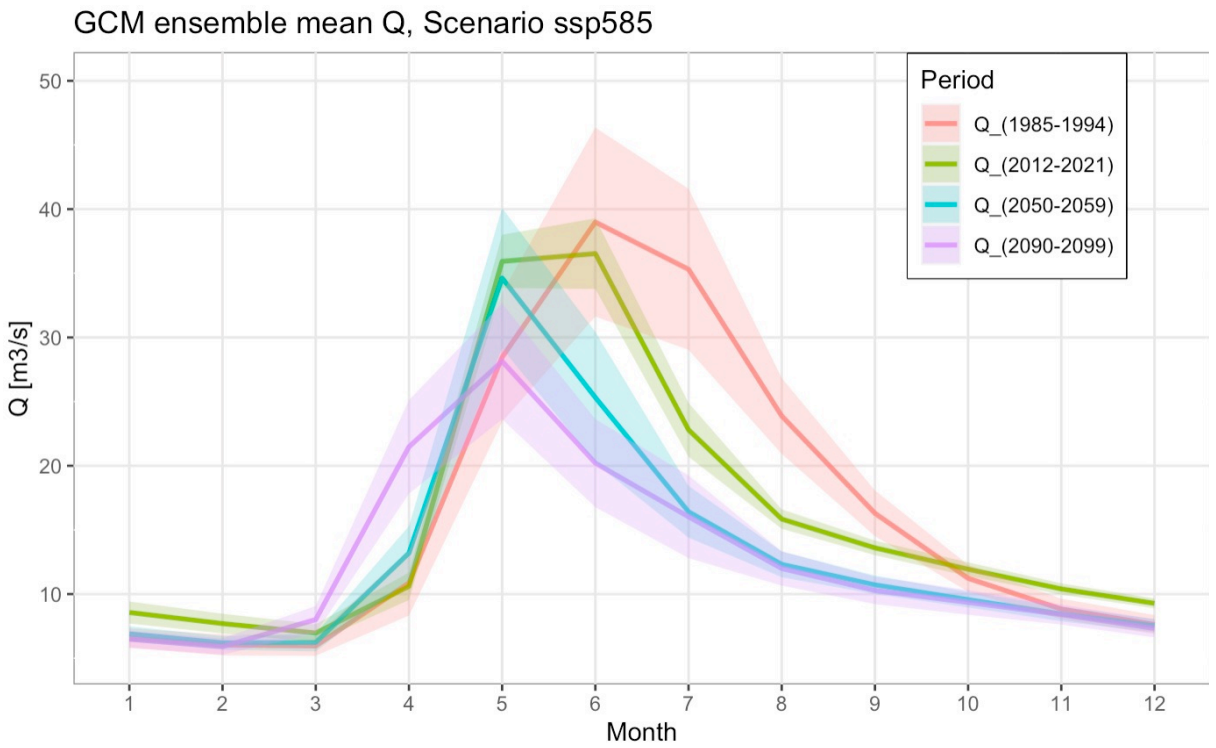
SECCA
Sustainable Energy Connectivity in Central Asia

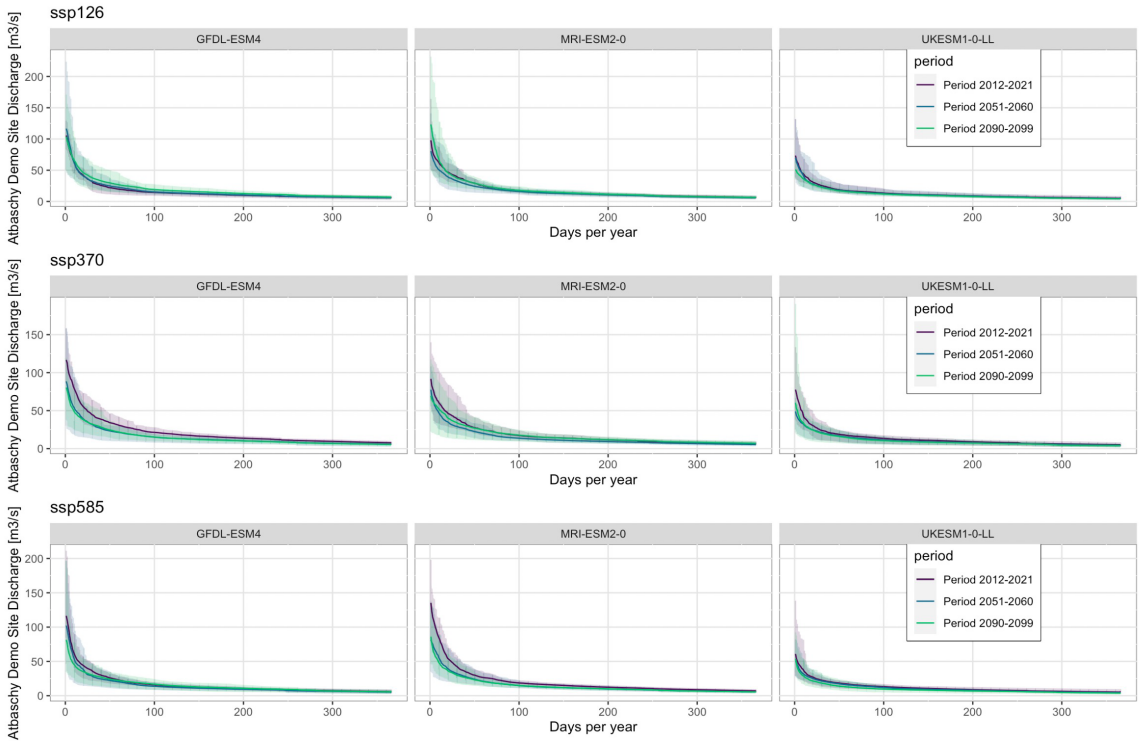
Tools & Methods: Drone Surveys

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Tools & Methods: Climate Change Impact on Hydrology





Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

DEMO SITE – SHAKIMARDAN, UZBEKISTAN

Funded by
the European Union

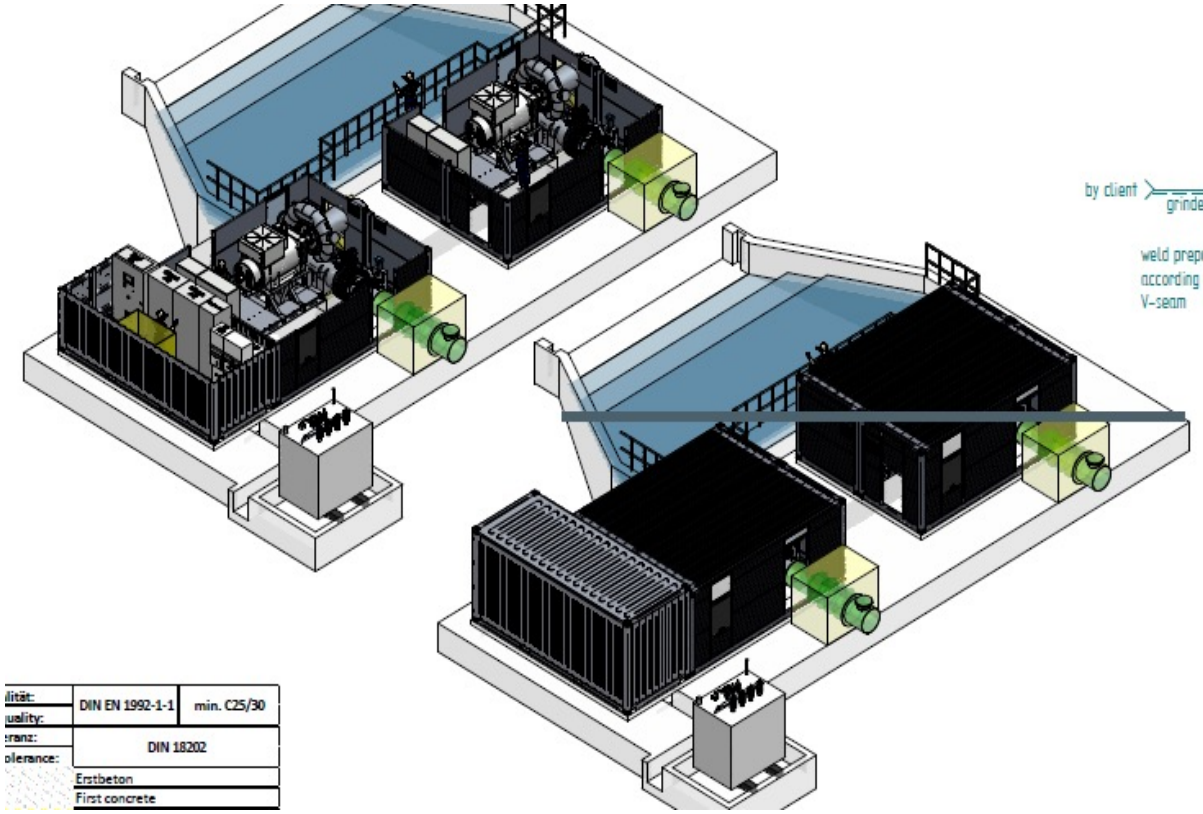
SECCA
Sustainable Energy Connectivity in Central Asia

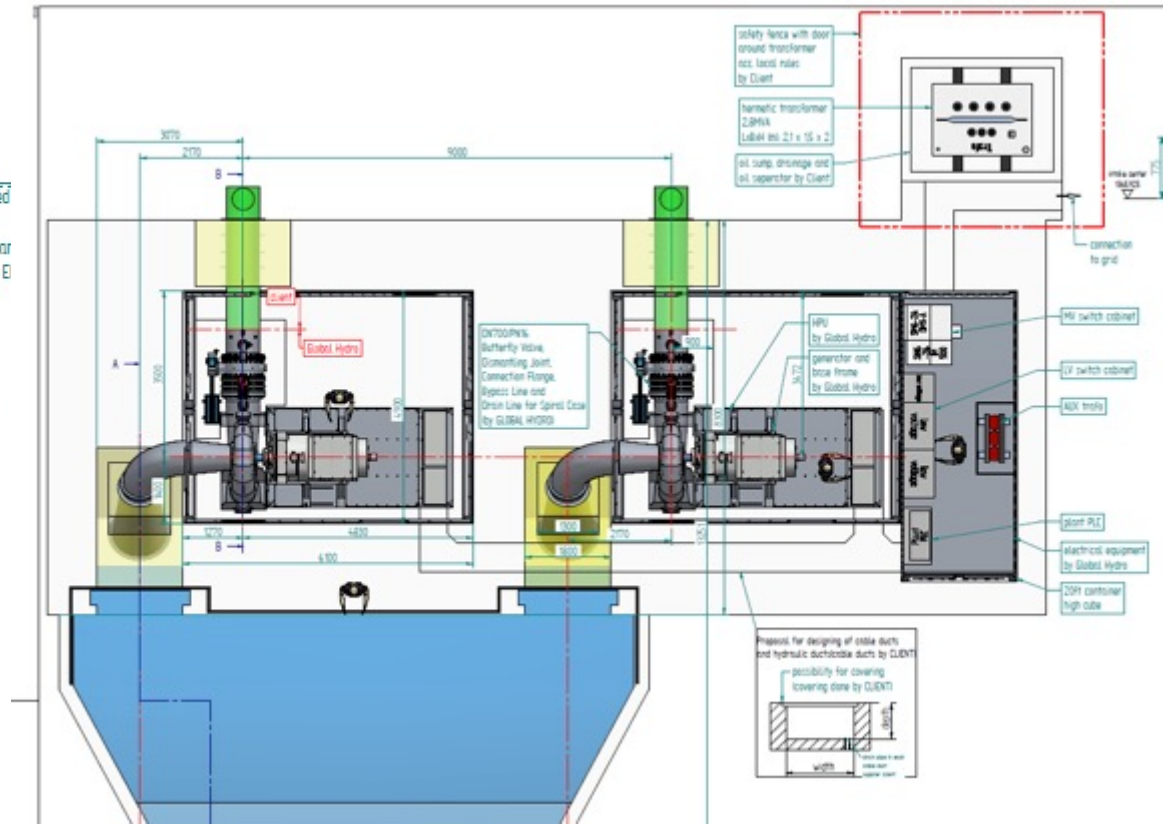
DEMO SITE – SHAKIMARDAN, UZBEKISTAN

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Demo Site Design - FCPS





Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

DEMO SITE – SHAKIMARDAN UZBEKISTAN

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

DEMO SITE – SHAKIMARDAN, UZBEKISTAN

- Existing infrastructure (Intake, Penstock) to be combined with new Francis Container solution
- Social project, power plant will be able to supply the enclave in Island Operation to enhance development of the area
- H ~ 85 m
- Q ~ 3 m^3/s
- P ~ 2 MW

Funded by
the European Union

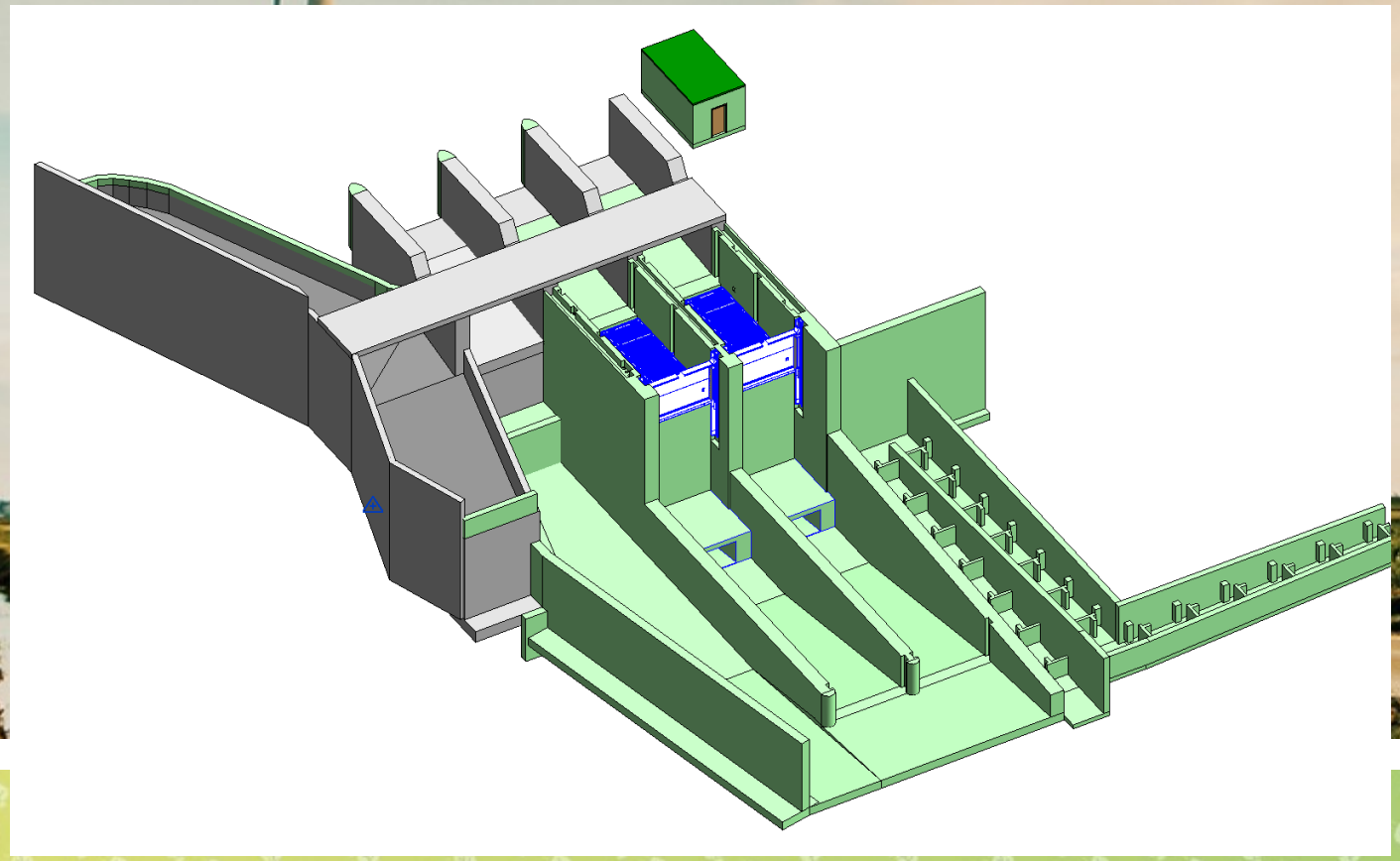
SECCA
Sustainable Energy Connectivity in Central Asia

- Existing Dam for Irrigation Diversion in need of refurbishment
- 3 gates, suitable for downstream integration of 2 Shaft Power Modules
- H ~ 7-8 m
- Q ~ 18 m^3/s
- P ~ 1.2 MW

DEMO SITE – AT-BASHI, KYRGYZSTAN

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia



DEMO SITE – AT-BASHI, KYRGYZSTAN

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

DEMO SITE – AT-BASHI, KYRGYZSTAN

Funded by
the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

OUTLOOK:
FCPS – Commissioning of the HPP in November 2024

- HSPS – Construction works are ongoing, and commissioning is planned for summer 2025
- 3 further bankable feasibility studies for similar-sized projects to be elaborated until 2025 (for subsequent commercial implementation)
- Guidelines and best practices for small hydropower development will be elaborated (replication tool)
- Target: Familiarizing Central Asian Stakeholders with the possibilities of innovative hydropower solutions from Europe → development of partnerships and new, commercial projects

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

Technical University of Munich

IWMI International Water Management Institute

GlobalHydro

ILF CONSULTING ENGINEERS

RESEARCH INSTITUTE NATURE AND FOREST

TIIAME NRU

sje Ecohydraulic Engineering

KJconsult

КЫРГЫЗ МАМЛЕКЕТТИК ТЕХНИКАЛЫК УНИВЕРСИТЕТИ

MUHR

Steinbeis Europa Zentrum
Enabling Innovators to Grow

BOKU

hydrosolutions

CARTIF

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

THANK YOU VERY MUCH FOR YOUR ATTENTION

Prof., Dr. Bakhtiyor Karimov

TIIAME National Research University, Department of "Ecology and water resources management"

E-mail:
bkarimov1960@gmail.com

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia