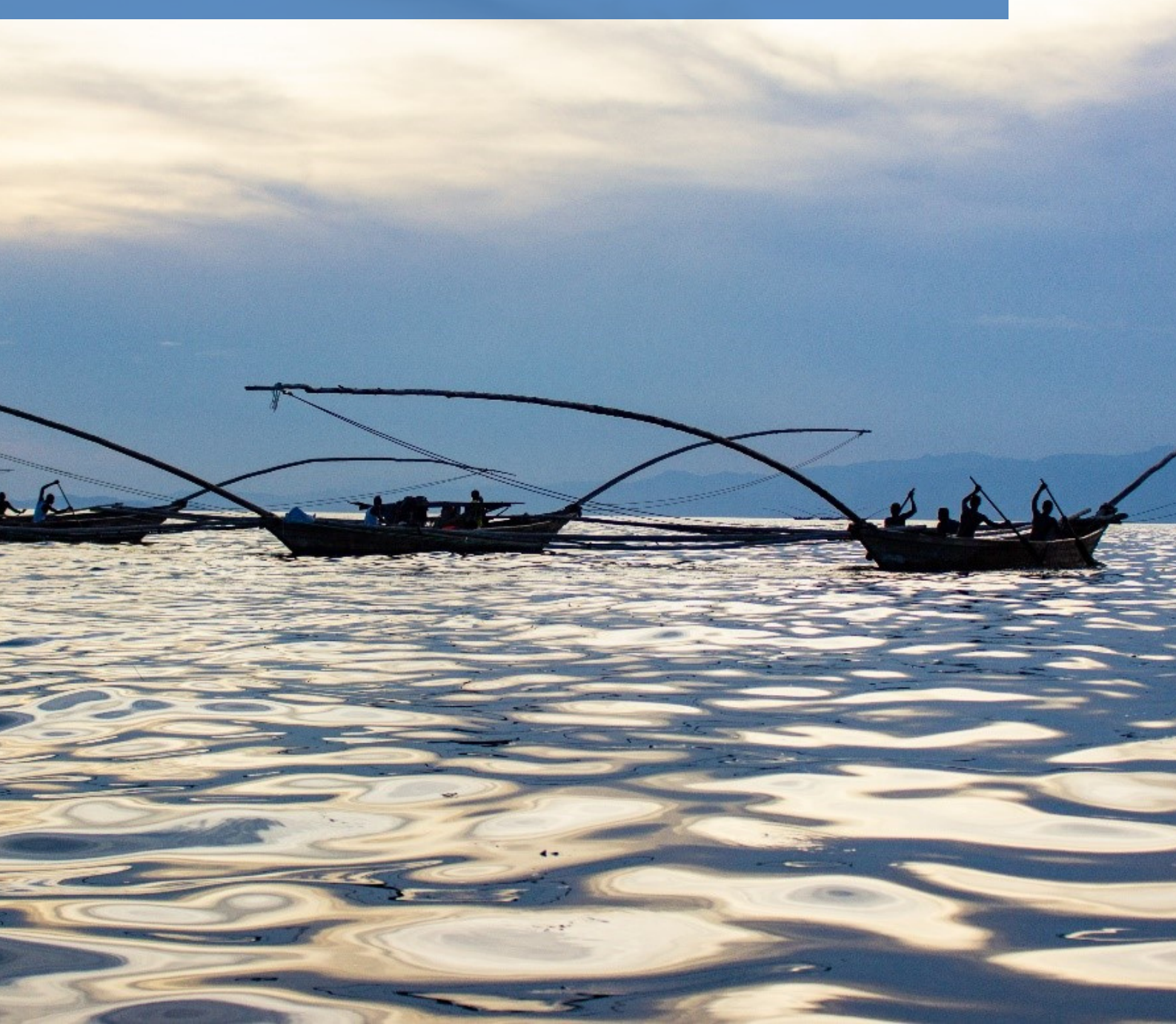


THE NIA NEXUS IMPACT ASSESSMENT (NIA) TOOLKIT

Turning Concepts into Action



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1. The Nexus Impact Assessment NIA Toolkit Introduction

Water resources, energy generation, and food production are interdependent (Allouche et al., 2015; Muller, 2015). Actions in one area often have effects in one or both other areas. For example, water is used in agricultural production and along the entire agri-food supply chain (Food and Agriculture Organization (FAO), 2011a). Agriculture accounts for 72 percent of total global freshwater withdrawals, making it the largest user of water (United Nations (UN) Water 2021). At the same time, food production and supply chain consume about 30 percent of total global energy (FAO, 2011b; 2022[1]).

Energy is required to produce, transport and distribute food as well as to extract, pump, lift, collect, transport and treat water. But one-third of all food produced globally is either lost or wasted (International Renewable Energy Agency (IRENA), 2015).

Efficiency measures along the agri-food supply chain can help save water and energy, such as drip and precision irrigation. Fossil fuel production, still a dominant part of the global energy mix, is highly water intensive, as is biofuel production and the growing practice of shale gas extraction. In contrast, other energy sources such as geothermal energy have great potential as a climate-independent resource that does not consume water or is less water-intensive (UN Water, 2022).

Overall, as global demand for water, energy and food is set to rise, due to changing consumption patterns and worldwide population growth, consideration for integrated problem solving is imperative. A further stressor is that the international supply chain system must deliver products and resources on a planet where predominant risks include extreme weather events, natural disasters, and resource depletion (World Economic Forum, 2018).

One of the main goals of the Nexus approach is to reduce or avoid negative trade-offs resulting from policy development in institutional “silos” (Belinskij, 2015). The Water-Energy-Food Security (WEF) Nexus approach gives recognition to the dynamic interlinkages between water, energy, and food security, with the intention of minimising unintended resource management risks and conflicts that arise with solely sectoral approaches.

Successful evaluation, documentation and communication of policy measures need reliable, and consistent data and information. Often, it is challenging to identify and quantify cross-sectoral resource dependencies, e. g. due to a lack of analytical tools and data that facilitate the operationalisation of the WEF Nexus or the identification of the added value of the integrated approach. This would support policy and decision-making processes for integrating the WEF Nexus approach into, for example, project development and monitoring processes. Furthermore, many projects are not direct Nexus projects, there are many projects at the interface of, for example, energy-water or water-agriculture, etc. Furthermore, critiques have emphasised the need for a transition from “nexus thinking” to “nexus action” and have called for the integration of qualitative and quantitative Nexus assessments (Simpson, G. B., and Jewitt, G. P. W., 2019).

In response to the needs and concerns, it was important to create a toolkit that would allow for example projects which are often built on a sector logic to think directly about the potential impacts on the other sectors during the project planning phase as well as during project implementation. The so-called Nexus Impact Assessment (NIA) Toolkit provides a comprehensive methodology and user-friendly tools that contribute to this transition, while the toolkit can be applied in different contexts,

[1] FAO 2022: Energy. Access: [Home | Energy | Food and Agriculture Organization of the United Nations \(fao.org\)](https://www.fao.org/energy/).

raise awareness of the benefits of the WEF Nexus and, for example, help project developers to plan and implement their projects across the WEF sectors.

The NIA Toolkit consists of four main elements, all of which can be used together, but also independently of each other:

- Firstly, the **WEF Nexus Principles**[2], which is a document with a selection of main principles that guide a successful application, implementation and operationalisation of the WEF Nexus approach at different levels and in different regions. It is based on concrete experiences of the WEF Nexus activities of the GIZ Nexus Regional Dialogues Programme. In doing so, it serves as a living document that can be further strengthened through exchanges and experiences with and of the global Nexus community and beyond.
- Secondly, the **WEF Nexus Safeguards** have been designed to enable policy makers as well as public and private project developers to determine whether a project or set of interventions and activities are improving water, energy, and food security, while avoiding negative impacts on another WEF sector. Using the developed WEF Nexus Safeguards checklists, it is easy to pre-assess whether the respective project or activities meet WEF safeguards requirements, imply WEF resource coherence and/or include measures that actively counteract negative trade-offs. After conducting the safeguards process, the project developer will either be aware of the WEF Nexus compliance of the projects and longevity and scalability and its significant co-benefits (e.g., in terms of climate mitigation, land restoration, and allowing for crowding-in private finance). Or the project developer learns where there is a need for improvement in terms of WEF Nexus compliance.

- Thirdly, both above-mentioned tools are accompanied with an excel-based **WEF Nexus Indicator** catalogue relevant to measuring WEF Nexus aspects, links to more information about how to measure each indicator, and where existing data may be retrieved. This catalogue is a dynamic tool, in that the set of indicators is non-exhaustive just like the endless possibility or combination of Nexus solutions. Interests and needs vary from project to projects, as does the way activities are measured, depending on what the project is trying to achieve. Therefore, the WEF Nexus indicators are not standard or mandatory indicators, but provide an overarching entry point, inspiration and help for the project developers themselves. In each case, it is possible to select indicators that are specific to the project under consideration.

Other products can be used to complement the NIA Toolkit: These include a **Monitoring and Evaluation (M&E) framework** within which projects can be monitored so as to evaluate if water, energy, food security components are improved, as well as other project objectives – such as land restoration, gender equality and improved livelihoods. It identifies the key elements of an M&E system, including the recommended steps, the basics of the Theory of Change, how to structure data collection activities and develop appropriate M&E indicators. In addition, the **Nexus Impact Assessment** of three demonstration projects in Ecuador, Peru and Niger, as well as **Cost-Benefit Analysis (CBA)** - methodology and applications of WEF Nexus projects can be taken into consideration. The CBAs offer stepwise approaches to quantify the outcomes of WEF Nexus projects and allow to assess the returns on investments in WEF Nexus project ex-post and ex-ante, from a private and societal perspective.

[2] Accessible at the Nexus Resource Platform: [nexus_principles.final.version.30-06-2020.pdf](https://nexus-principles.final.version.30-06-2020.pdf) (water-energy-food.org).

Overall, the NIA Toolkit is a tool to complement also other existing documents that are important for a successful project set-up such as existing national strategies, gender safeguards etc.

The primary target group of the NIA Toolkit includes professionals such as policymakers and project developers from the public and private sector, directly involved in the implementation of WEF Nexus activities. Or also those indirect involved stakeholders from development agencies, Non-Governmental Organisations (NGO), development banks, local communities, river basin organisations, etc.

For example, the applications of a Cost-Benefit Analysis and therein quantification of the outcomes of WEF Nexus projects and the monetary benefits they provide can be useful for agencies that are investing or considering an

investment in WEF Nexus activities and would like to assess whether the project is achieving what was intended and to estimate the potential or actual benefits of the WEF Nexus activities.

Figure 1 below shows the components of the NIA Toolkit and CBA, and the main steps associated with implementing, either or all of them.

Steps in using the Nexus Impact Assessment (NIA) Toolkit

In the very early stages, the project is conceived by the project developer. At this stage, the WEF Nexus principles and WEF Nexus Safeguards are applied to ensure that the project is WEF Nexus compliant (compared to other projects that could result in negative trade-offs).

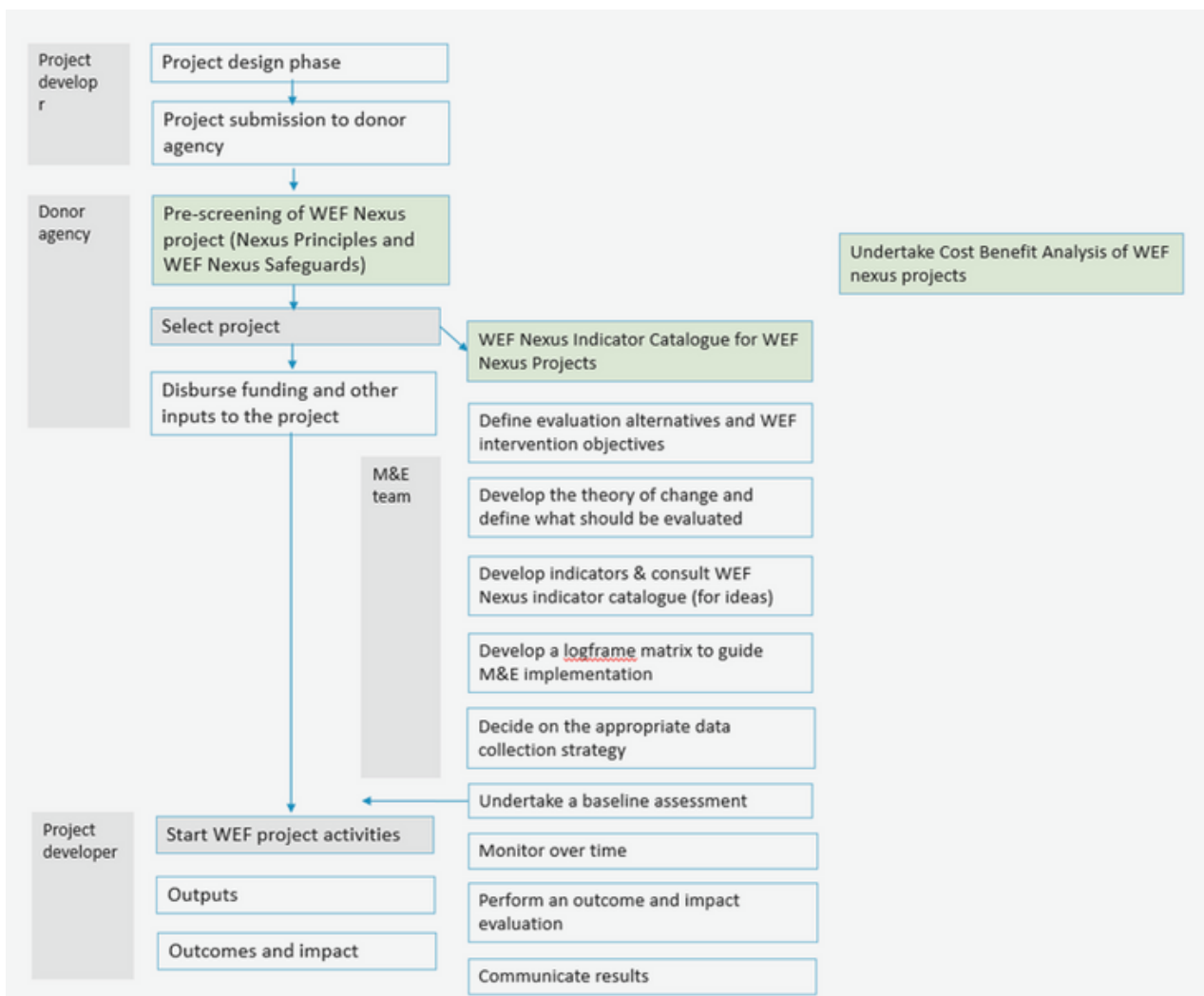


Figure 1: Components of Nexus Toolkit, Nexus Impact Assessment and Cost-Benefit Analysis

The WEF Nexus Indicator Tool can also be used to set up a project or activity cross-sectorally and define common indicators that guarantee long-term water, energy and food security. All this is to ensure that the respective project makes best use of existing interconnections and/or includes measures to actively counteract negative trade-offs.

A cost-benefit analysis (CBA) can be applied at different stages of a project cycle (ex-ante, inception, as a mid-term evaluation or ex-post) in order to determine the long-term net monetary value of project. The CBA can be ex-ante, e. g. to assess the case for investing in the project, or to help inform decision-makers about the value of the planned activities. Similarly, the CBA can be used ex-post to obtain a comprehensive understanding of the societal value of the WEF Nexus project and to determine whether there is a case for replicating the activities.

Overall, the various tools comprised in this NIA Toolkit serve the purpose of ensuring the highest degree of resource efficiency in relevant project and policy design. At the same time, it provides guiding documents to support a comprehensive assessment process to illustrate that an integrated approach ensures greater impact, despite higher-upfront transaction costs (monetary and non-monetary). This document seeks to highlight the importance of sound data management as an important pre-requisite for a WEF Nexus assessment. It therefore dedicates an entire document on the key factors/elements of a monitoring and evaluation (M&E) system and undertake a baseline assessment, against which project outcomes can be evaluated. Indicators and data collected for the M&E assessment may also serve to inform the CBA.

The NIA Toolkit was developed, in parallel to the piloting of the M&E and CBA framework, in four locations worldwide (running Q1 2021 to Q1 2023), including:

- **Niger:** A CBA of the implementation of a solar-powered irrigation scheme (SPIS), substituting fuel driven pumps, implemented on a communal land plot held by an association of women in Kollo (Verdone, M., 2022).
- **Peru:** An M&E Plan and CBA analysis for a set of WEF Nexus interventions in the community of San Pedro de Casta. The interventions include the building of a solar-powered greenhouse for crops production and, a guinea pig rearing facility as well as the rehabilitation of an ancient water pond. Jointly these activities are designed to increase food production throughout the year, increase groundwater infiltration and resilience to environmental disaster risks (see Sales, 2022).
- **Ecuador:** An intervention to help the Kallari association in the canton of Tena to switch from a fossil-fuel driven cocoa drying process to an innovative and energy efficient solar-powered process. Aside from reducing greenhouse gas emissions, this is likely to have positive impact on cocoa farmers, as they may be able to get higher prices for cocoa beans.
- **Uzbekistan and Turkmenistan:** A CBA of different sediment management options for the Tuyamuyun Hydro Complex (THC). These interventions are designed to enhance the lifetime of the reservoir to safeguard food, water and energy security, whilst making productive economic use of the sediment.

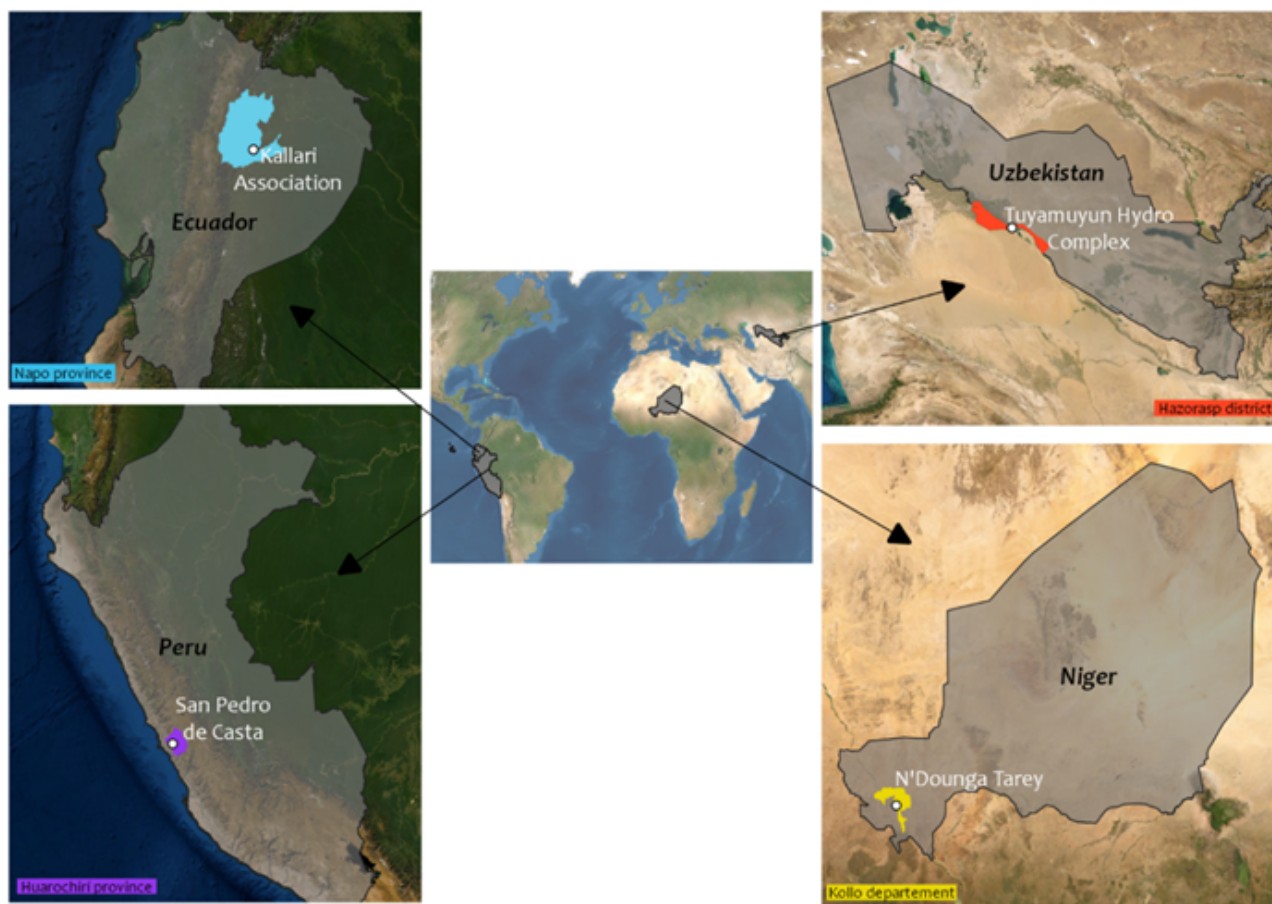


Figure 2: NIA Toolkit demonstration projects

These projects are referred to where appropriate in the NIA Toolkit. The interested reader can also consult the relevant publications or working papers for concrete examples. In addition, accompanying documents with more information on the respective tools complement the NIA toolkit and can be accessed if interested.

Thus, the NIA Toolkit raises awareness on the interlinkages between water, energy, food and environment and provides food for thought to reflect on and consider possible trade-offs on other sectors. With the help of the toolkit, the primary target group such project developers or decision-makers are supported in identifying the potential of multi-sectoral interventions, thereby ensuring cross-sectoral project planning and implementation and making sure that the project maximises synergies to increase the impact while not negatively impacting on the other sectors.

By using the tools, one is able to measure and evaluate cross-sectoral impacts (as well as benefit over cost ratio) across the WEF Nexus and beyond (such as livelihood and environment). It is a toolkit that helps to move from silo thinking to Nexus doing – from sectoral project planning and implementation to integrated planning and implementation.