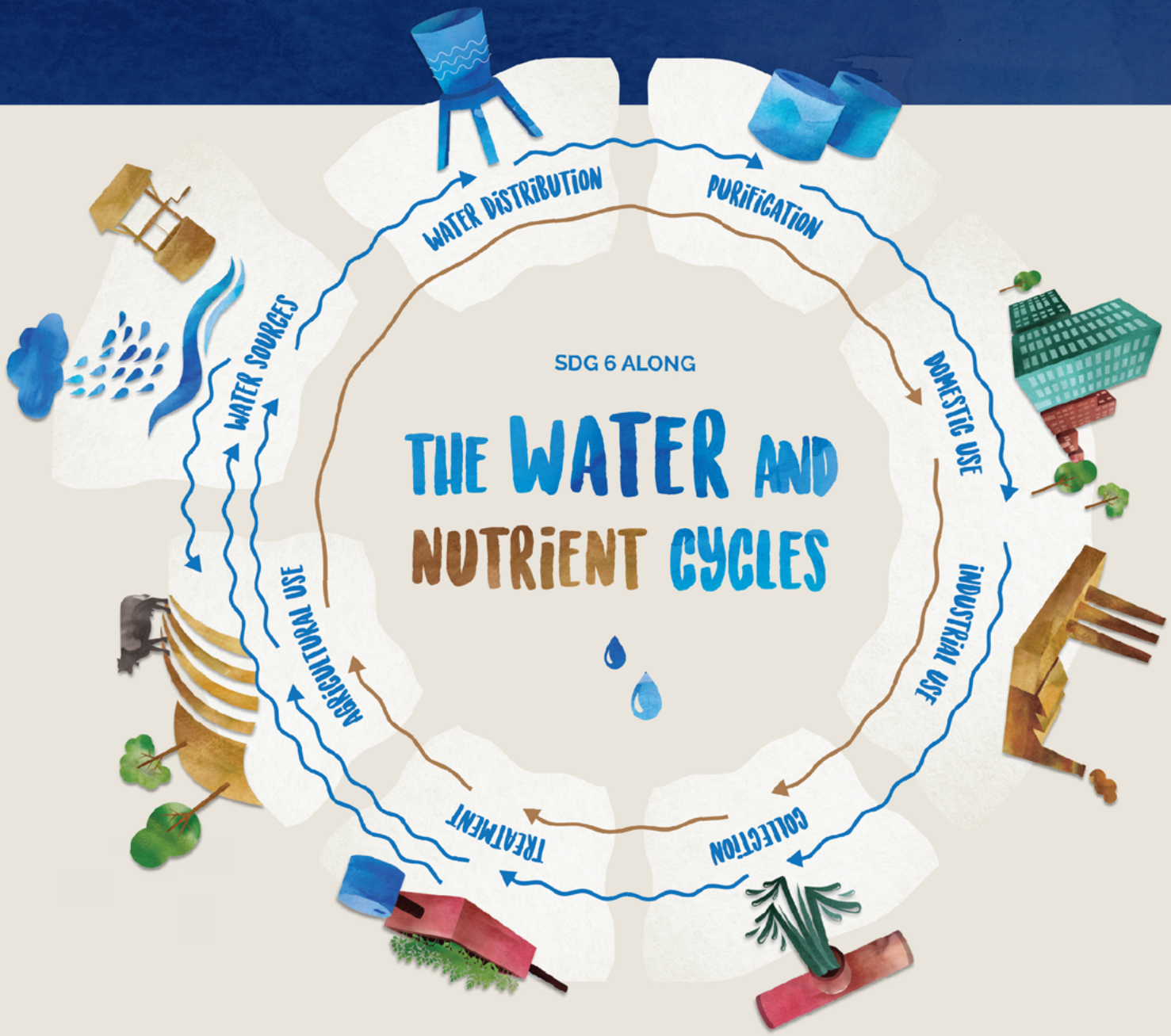
SDG 6 along THE WATER AND NUTRIENT CYCLES

Using the water and nutrient cycles as a tool for creating a common understanding of a water and sanitation system - including workshop material.



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Swiss Agency for Development and Cooperation SDC

SDG 6 ALONG

THE WATER AND NUTRIENT CYCLES

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Editors: AGUASAN Community of Practice

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INTRODUCTION

The SDG 6[1]: The 2030 Agenda includes a dedicated goal on water and sanitation (SDG 6) that aims to *ensure availability and sustainable management of water and sanitation for all.* The goal includes six targets that give a normative framework and direction for development efforts in water and sanitation[2]:

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking **water** for all

6.2 By 2030, achieve access to adequate and equitable **sanitation** and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water **quality** by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4 By 2030, substantially increase water-use **efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.5 By 2030, implement integrated water resources management **(IWRM)** at all levels, including through transboundary cooperation as appropriate

6.6 By 2020, protect and restore water-related **ecosystems**, including mountains, forests, wetlands rivers, aquifers and lakes

Water and sanitation at the heart of the 2030 Agenda: Water is at the heart of the 2030 Agenda as it contributes to the achievement of many other goals. As interventions in water and sanitation can trigger improvements towards other goals like health, poverty, food security, it makes sense using the water and sanitation system of a region as an entry point to tackling the 2030 Agenda. Likewise, working on other goals like education and governance can leverage interventions in water and sanitation.

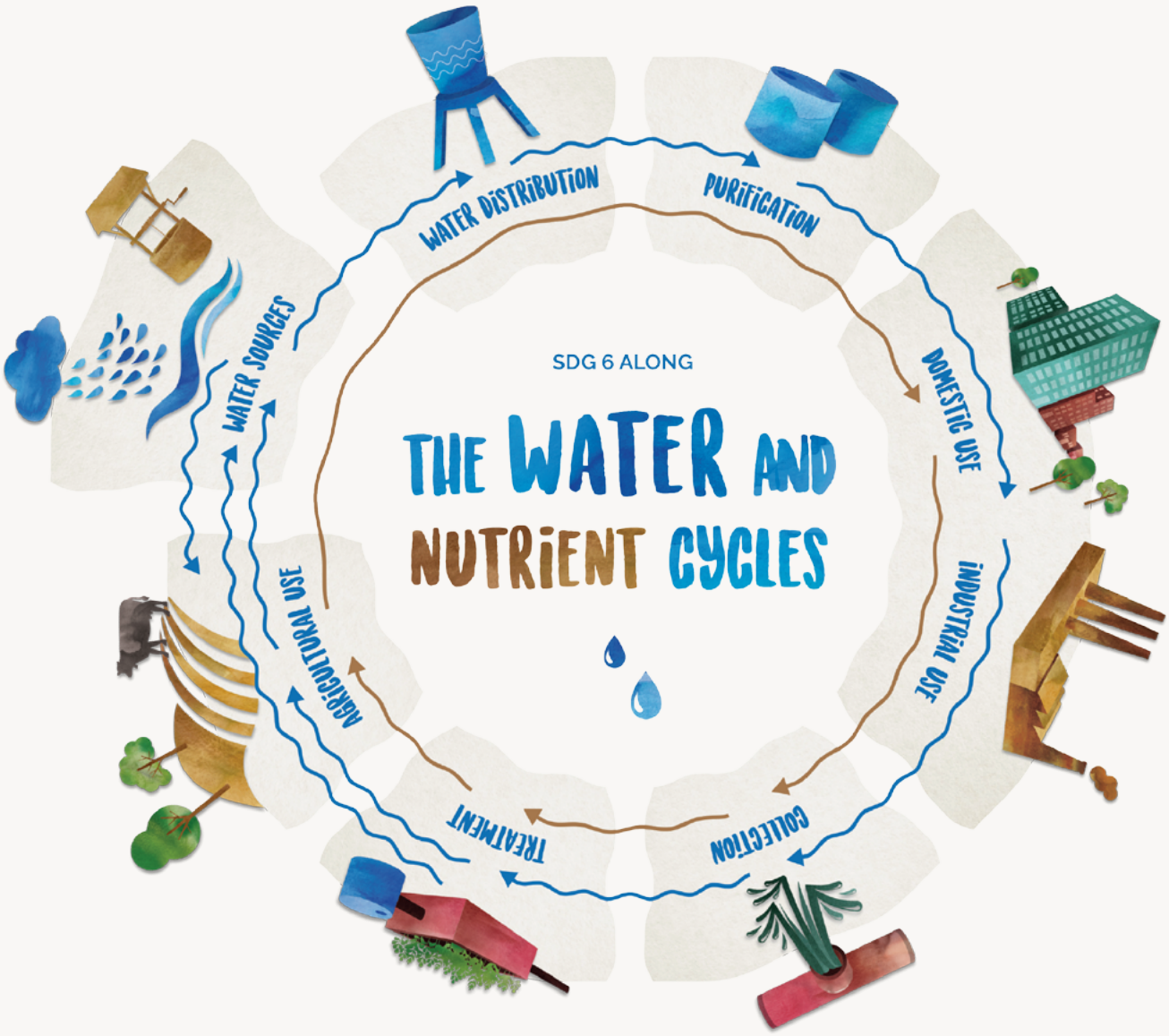
Creating a common understanding: Ensuring availability and sustainable management of inclusive water and sanitation services requires different stakeholders to engage collectively to change their water and sanitation system. Before defining the collective action that will lead to achieving SDG 6, a common understanding of the specific water and sanitation system must be developed among all stakeholders. Collective change processes are characterized by conflicts that arise from sectoral thinking patterns or conflicting interests. So, before developing a national development agenda, a common understanding of the system must be created by defining the interdependencies within the water and nutrient cycles and contextualising the SDG 6 within this system.

Collective decision-making: In doing so, the various singular perspectives can be analysed, differences identified and harmonized and collective decision-making enabled. This allows for dealing with the complexity of the system, for favouring the inclusion of stakeholders that are not experts such as ordinary citizens and children or for mobilizing political decision-makers that may lack political will to induce a change process.
In June 2016, during the annual AGUASAN[3] workshop, this approach of using the water and nutrient cycles and aligning them with the SDG 6 was used. The interdependencies between the targets and the challenges in three example countries (Haiti, Macedonia and Tanzania) were identified. The approach to using the water and nutrient cycles as a tool for creating a common understanding of a water and sanitation system will be described on the following pages. If you wish to use the tool for your own stakeholder workshop, you will find the water and nutrient cycles graphics at the end of this publication.

[1] The Sustainable Development Goal 6

[2] Source: United Nations (n.y.)

[3] AGUASAN (www.aguasan.ch) is an interdisciplinary Swiss Community of Practice (CoP) that brings together a broad range of specialists to promote wider and deeper understanding of key water and sanitation management issues in developing and transition countries. It builds on committed sector professionals from various specialised institutions involved in Swiss development cooperation, humanitarian aid and research. Since 1984, the CoP provides an exemplary, vibrant and most pertinent exchange platform and think-tank serving the water sector, and constitutes an essential link in the innovation and knowledge management strategy of the Swiss Agency for Development and Cooperation (SDC).



EXPLANATION: Water cycle Nutrient cycle

THE WATER AND NUTRIENT CYCLES

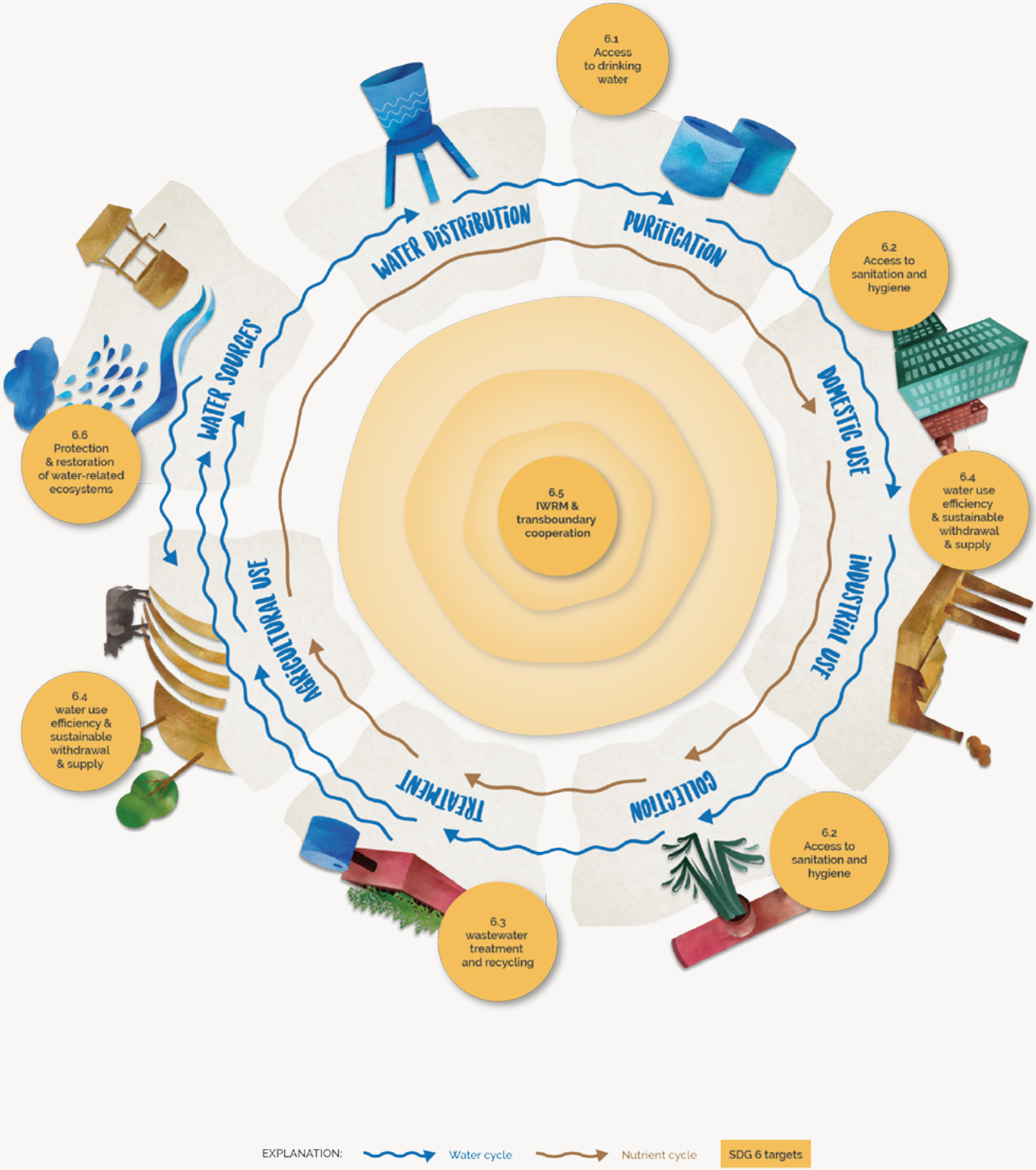
The first step in achieving SDG 6 is to collectively understand a water and sanitation system by depicting the water and nutrient cycles and the various stakeholders that are involved.

The water and nutrient cycles in a nutshell: The graphic on the previous page is a simplified depiction of the water and nutrient cycles and how a society should ideally organize water and nutrient flows to sustainably satisfy its needs in the long-run. These functional steps show how water coming from different water sources (ground-, rain- or surface water) is distributed, purified and used in households and industry. Organic and chemical pollutants enter the water cycle, the resulting product – wastewater – is then collected and treated. The treated wastewater can be reused in agriculture or will return to the natural water cycle to eventually recharge groundwater sources. Ideally, all nutrients are extracted from the wastewater and reused to produce food or animal feed [4].

In such an ideal water and sanitation system, both the water and the nutrient cycles are closed, without pollution of the water sources nor depletion of the organic content of the soils.

Understanding the system: During the collective exercise of describing the existing water and nutrient cycles, the different perceptions of the system and its functionalities by the different stakeholders are spelled out, which in turn allows for defining the system boundaries. In many cases, a water and sanitation system coincides with the limits of watersheds and spans across administrative boundaries. If done early enough in the change process, this collective description can trigger the inclusion of relevant stakeholders from the watershed as opposed to administrative levels. This mapping of stakeholders such as utilities, municipalities or farmer associations can be depicted on an additional layer in the graphic (not shown here).

[4] See also the Sustainable Sanitation and Water Management Toolbox (www.sswm.info) for comprehensive resources on hardware and software tools for the implementation of sustainable sanitation and water management projects.


6.1
Access
to drinking
water
WATER DISTRIBUTION
PURIFICATION
6.2
Access to
sanitation and
hygiene
DOMESTIC USE
6.4
water use
efficiency
& sustainable
withdrawal
& supply
INDUSTRIAL USE
COLLECTION
6.2
Access to
sanitation and
hygiene
TREATMENT
6.3
wastewater
treatment
and recycling
AGRICULTURAL USE
6.4
water use
efficiency &
sustainable
withdrawal
& supply
WATER SOURCES
6.6
Protection
& restoration
of water-related
ecosystems
6.5
IWRM &
transboundary
cooperation
EXPLANATION:
Water cycle
Nutrient cycle
SDG 6 targets

SDG 6 ALONG THE WATER AND NUTRIENT CYCLES

Once the water and sanitation system and its boundaries have been depicted, the link between the normative framework of the SDG 6 and the water and nutrient cycles are established to translate the SDG 6 targets to national development targets.

SDG 6 – a new paradigm: The 2030 Agenda covers all aspects of sustainable development reflected in 17 goals and 169 targets valid worldwide. While the MDG[5] only opted for 50% achievement ("halving poverty"), the SDG 6 aims at *leaving no one behind* by achieving 100% availability and sustainable management of water and sanitation. SDG 6 takes an integrated approach and covers the entire water cycle with its 6 targets, including the sustainable management of water resources and the protection of ecosystems [6].

SDG 6 along the water and nutrient cycles: The SDG 6 targets illustrated by yellow circles in the graphic on the previous page [7] address the *functional steps* of the water and nutrient cycles. SDG 6.5 (IWRM) relates to the whole water cycle as it is the underlying framework for integrated water resources management.

SDG 6.1 (water) is related to the steps *distribution, purification* and *use* of water in *households* and *industry*. Use of water for *industrial* purposes is also subject to SDG 6.4 (efficiency). SDG 6.2 (sanitation) addresses the functional steps *domestic use* (of toilet facilities), *collection* and *treatment of wastewater*. Achieving SDG 6.3 (water quality) allows for the *recharge* of water sources and the *reuse* of water and nutrients in *agriculture*. Achieving SDG 6.4 (efficiency) is crucial in agriculture as irrigation is the biggest water use on earth. SDG 6.6 (ecosystems) addresses the protection of water sources and of the vital ecosystem services of wetlands.

Importance of data: To be able to set and monitor the development agenda, it is crucial to first gather the relevant data illustrating the current state of the system, and then to continuously compare it to the SDG 6 targets. For this purpose, 11 core indicators have been set for SDG 6 [8].

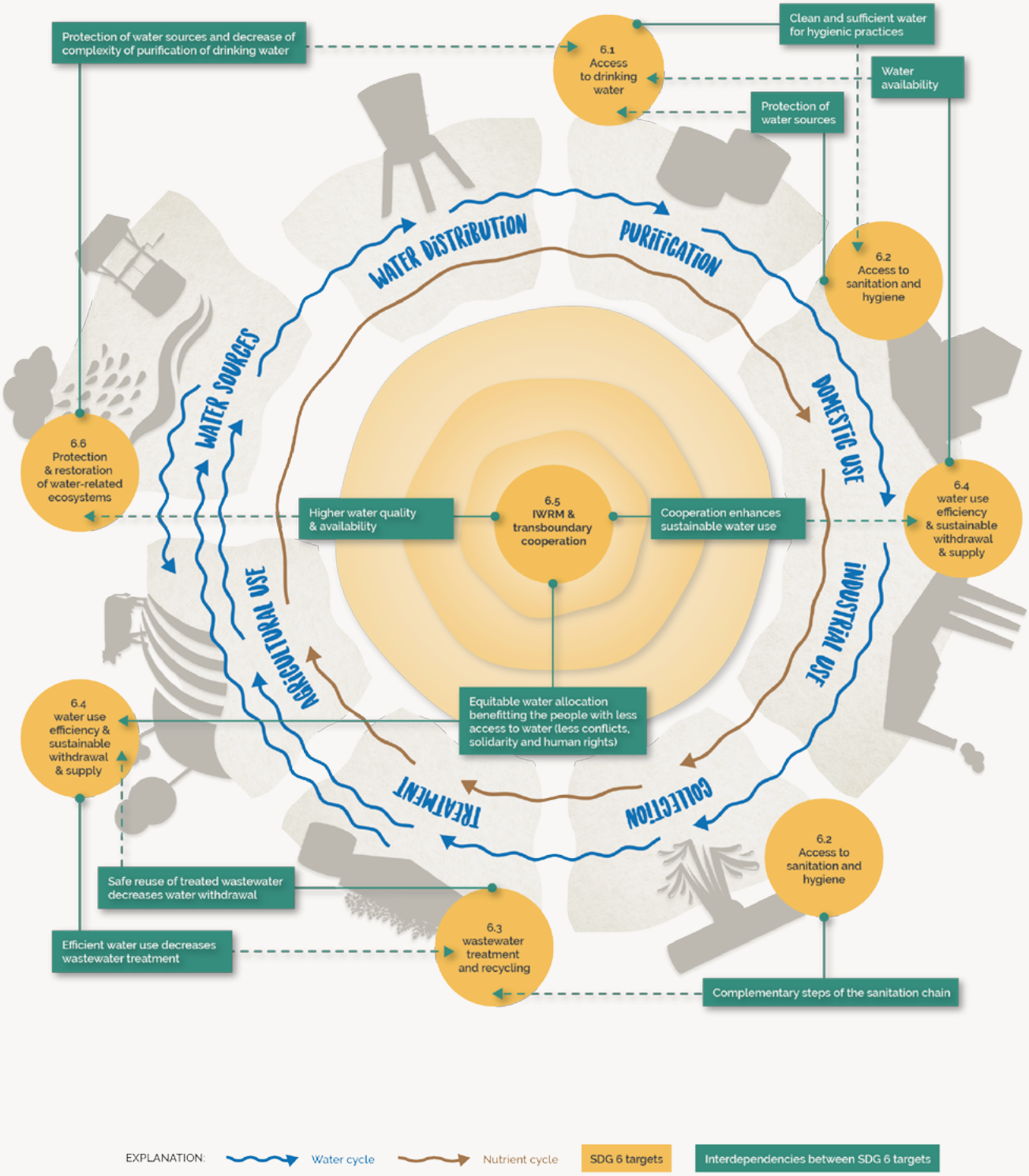
During the collective exercise, establishing the link between water use and SDG 6.4 (efficiency) in Macedonia revealed that – although there is no water scarcity in Macedonia – non-revenue water in drinking water supply amounts to 30-70%, affecting the target of universal access to water for the whole population, currently ranging from 60-100%. As there is no threshold on non-water revenue, it is difficult to set quantified targets in the planning process.

[5] The Millenium Development Goals

[6] Implementing the Water Goal – SDG in practice (2016)

[7] Please note that this graphic is only an example of how the water and sanitation system could look like. Each context might feature different functional steps and related targets depending on the stakeholders' understanding.

[8] see also: UN Water (2016a) and UN Water (2016b)


Protection of water sources and decrease of complexity of purification of drinking water
6.1 Access to drinking water
Clean and sufficient water for hygienic practices
Water availability
Protection of water sources
6.2 Access to sanitation and hygiene
WATER DISTRIBUTION
PURIFICATION
DOMESTIC USE
WATER SOURCES
6.6 Protection & restoration of water-related ecosystems
Higher water quality & availability
6.5 IWRM & transboundary cooperation
Cooperation enhances sustainable water use
6.4 water use efficiency & sustainable withdrawal & supply
AGRICULTURAL USE
INDUSTRIAL USE
Equitable water allocation benefitting the people with less access to water (less conflicts, solidarity and human rights)
6.4 water use efficiency & sustainable withdrawal & supply
TREATMENT
COLLECTION
6.2 Access to sanitation and hygiene
Safe reuse of treated wastewater decreases water withdrawal
Efficient water use decreases wastewater treatment
6.3 wastewater treatment and recycling
Complementary steps of the sanitation chain
EXPLANATION:
Water cycle
Nutrient cycle
SDG 6 targets
Interdependencies between SDG 6 targets

INTERDEPENDENCIES OF THE SDG 6 TARGETS

Understanding the mutually reinforcing interdependencies among the targets permits a better grasp of the integrated approach of SDG 6 and is illustrated with green arrows in the graphic on the previous page [9]. This is the next step towards getting a common understanding of the system.

Mutually reinforcing interdependencies: The interconnectedness of water resources used for food, energy and industrial production is evident within the context of SDG 6 targets. Since the water resources specific to each target are often managed by different stakeholders, coordination is needed to integrate approaches and identify leverage points within the cycles in order to optimise management of water systems. For example, the graphic underscores how access to sanitation (6.2) protects water sources supporting access to drinking water (6.1), and that on-site treatment of faecal sludge reduces the burden on collection and wastewater treatment systems (6.3) and the environment (6.6). Protecting water sources within ecosystems (6.6) contributes to purification of drinking water (6.1). Investments in water use efficiency and sustainable withdrawal (6.4) increase the availability of water for drinking, contributing to equitable water allocation (6.5). Wastewater treatment and recycling systems (6.3) reduce the level of pollution affecting the ecosystem (6.6). These same systems reduce the demand for withdrawal (6.4) which, in turn, reduces water treatment requirements. [10]

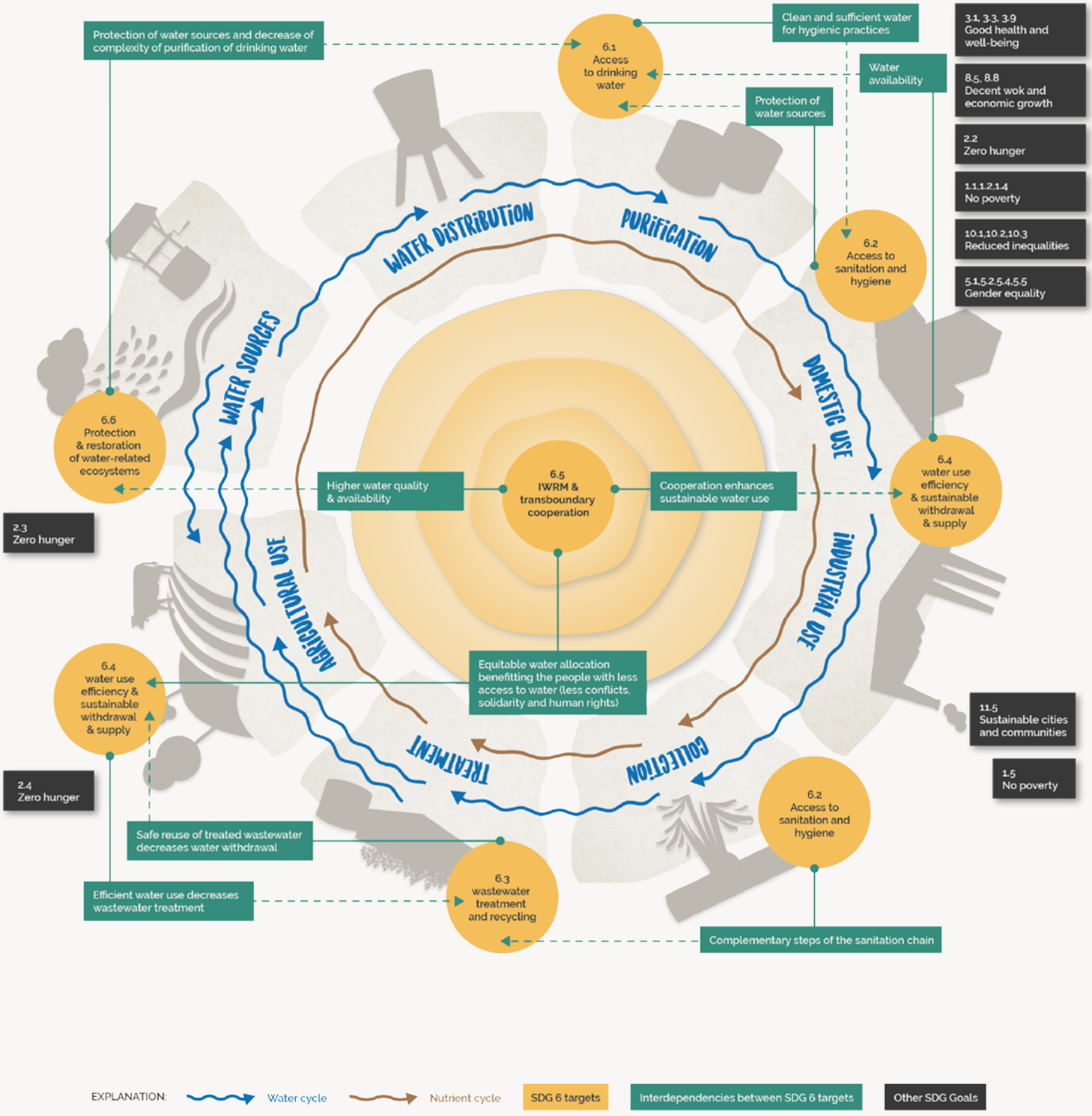
Despite the complexity of the system and the need for integrated approaches, there are entry points to leverage the interdependencies to enable a multiplier effect for development interventions.

During the collective exercise, the Haiti analysis identified SOIL's Portable container based toilet unit and emptying service (www.oursoil.org) in urban areas as an example of the mutually reinforcing link between access to sanitation (6.2) and water source protection (6.1). The EcoLakay toilet conserves water and is an alternative to subterranean onsite sanitation systems in areas with high groundwater tables. SOIL produces and sells of organic compost for agriculture and reforestation, contributing to protect and restore ecosystems (6.6). An example of the link between managing watersheds (6.5) and drinking water sources (6.1) is work led by Helvetas to address the absence of enforced legal frameworks to prevent groundwater pollution. Since 2008, Helvetas has promoted locally managed water source protection and upstream watershed restoration in rural Haiti [11] . This included a) local comprehension of the environmental, socio-cultural and legal risks that mobilised municipal decrees for watershed and environmental management and b) bio-engineering measures to reduce erosion and water runoff.

[9] Please note that this graphic is only an example of how the water and sanitation system could look like. Each context might feature different interdependencies depending on the stakeholders' understanding.

[10] Source: UN Water (2015a)

[11] See also: https://assets.helvetas.org/downloads/capex_hsi_protection_des_source_vlongue.pdf (in French)


Protection of water sources and decrease of complexity of purification of drinking water
6.1 Access to drinking water
Clean and sufficient water for hygienic practices
Water availability
Protection of water sources
3.1, 3.3, 3.9 Good health and well-being
8.5, 8.8 Decent wok and economic growth
2.2 Zero hunger
1.1,1.2,1.4 No poverty
10.1,10.2,10.3 Reduced inequalities
5.1,5.2,5.4,5.5 Gender equality
6.2 Access to sanitation and hygiene
WATER DISTRIBUTION
PURIFICATION
DOMESTIC USE
INDUSTRIAL USE
COLLECTION
TREATMENT
AGRICULTURAL USE
WATER SOURCES
6.6 Protection & restoration of water-related ecosystems
2.3 Zero hunger
Higher water quality & availability
6.5 IWRM & transboundary cooperation
Cooperation enhances sustainable water use
6.4 water use efficiency & sustainable withdrawal & supply
Equitable water allocation benefitting the people with less access to water (less conflicts, solidarity and human rights)
6.4 water use efficiency & sustainable withdrawal & supply
2.4 Zero hunger
11.5 Sustainable cities and communities
1.5 No poverty
6.2 Access to sanitation and hygiene
Safe reuse of treated wastewater decreases water withdrawal
Efficient water use decreases wastewater treatment
6.3 wastewater treatment and recycling
Complementary steps of the sanitation chain
EXPLANATION:
Water cycle
Nutrient cycle
SDG 6 targets
Interdependencies between SDG 6 targets
Other SDG Goals

SDG 6 AT THE HEART OF THE 2030 AGENDA

Water is life and the basis for sustainable development in all its dimensions: SDG 6 is inherently linked to the other 16 SDG of the 2030 Agenda (illustrated with grey boxes in the graphic on the previous page [12]). Understanding both, the reinforcing and conflicting interdependencies with the other goals is key to effective mainstreaming of water and sanitation outside of the water and sanitation sector. The following examples highlight some of these key links[13]:

Water, health and equality: Increasing access to water supply, sanitation and hygiene (SDG 6.1 and 6.2) reduces the risks of water-borne diseases (SDG 3.1-3.3, 3.9) and malnutrition (SDG 2.2), supports a productive workforce (SDG 8.5, 8.8) and addresses poverty (SDG 1.1, 1.2, 1.4), gender and inequality (SDG 5.1, 5.2, 5.4, 5.5, 10.1 - 10.3).

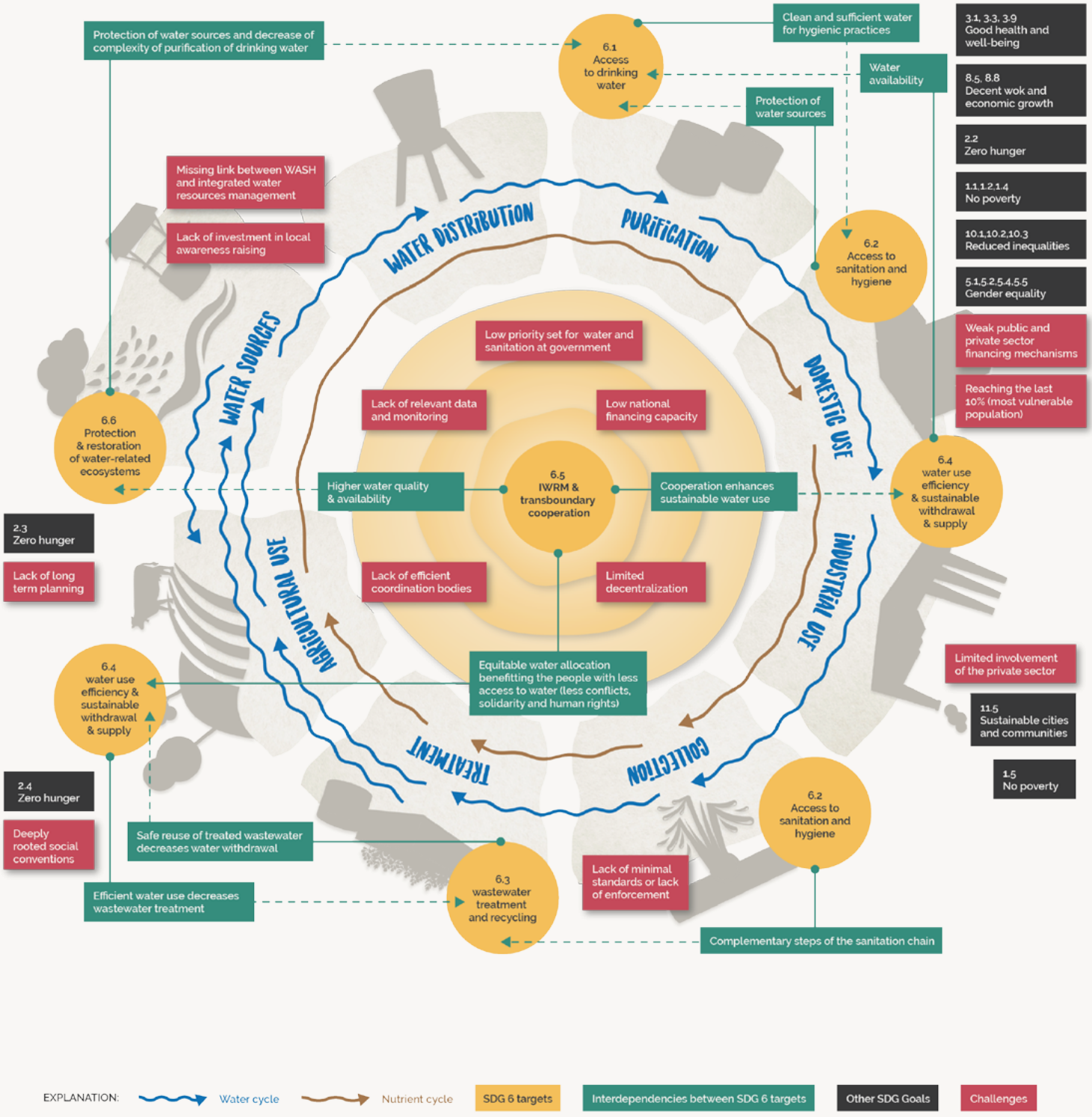
Water, food and environment: Water is essential to meet the targets of sustainable food production (SDG 2.4). Doubling agricultural productivity as stated in SDG 2.3 could potentially lead to negative impacts on water resources and water-related ecosystems. Targets must therefore be implemented in an integrated way to ensure they support targets on increasing recycling and safe reuse of water (SDG 6.3), increasing efficiency and ensuring sustainable withdrawals (SDG 6.4) and protecting water-related ecosystems (SDG 6.6).

Water, Climate Change and Disasters: Using water sustainably and efficiently, reducing water scarcity (SDG 6.4) and implementing IWRM (SDG 6.5) are interlinked with reducing the impact of water-related disasters (SDG 11.5) and helping to build the resilience of vulnerable populations (SDG 1.5). Therefore, prioritizing the use of water resources is needed, particularly when they are scarce.
These interdependencies of SDG 6 with the other SDG show the integrated nature of the 2030 Agenda and call for integrated approaches.

During the collective exercise, analysing these interdependencies revealed the mutually reinforcing link between agricultural productivity (SDG 2.3) and protection of water sources (SDG 6.6) in the Kenyan example F3 Life. F3 Life (www.f3-life.com) launched Africa's first payments for ecosystem services project, where smallholder farmers can access eco-loans that require the adoption of sustainable soil and water management techniques in the loan terms. With the adoption of environmental-friendly agricultural practices, more attractive interest rates and credit limits are granted and a win-win situation is created: overland run-off, soil loss and reservoir silting are reduced while yields, water quality, climate change resilience and the farmer's income are increased.

[12] Please note that this graphic is only an example of how the water and sanitation system could look like. Each context might feature different SDG depending on the stakeholders' understanding.

[13] Source: UN Water (2016c)


Protection of water sources and decrease of complexity of purification of drinking water
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Clean and sufficient water for hygienic practices
3.1, 3.3, 3.9 Good health and well-being
Water availability
8.5, 8.8 Decent wok and economic growth
Protection of water sources
2.2 Zero hunger
1.1,1.2,1.4 No poverty
Missing link between WASH and integrated water resources management
Lack of investment in local awareness raising
WATER DISTRIBUTION
PURIFICATION
6.2 Access to sanitation and hygiene
10.1,10.2,10.3 Reduced inequalities
5.1,5.2,5.4,5.5 Gender equality
Weak public and private sector financing mechanisms
Reaching the last 10% (most vulnerable population)
WATER SOURCES
DOMESTIC USE
Low priority set for water and sanitation at government
Lack of relevant data and monitoring
Low national financing capacity
6.6 Protection & restoration of water-related ecosystems
Higher water quality & availability
6.5 IWRM & transboundary cooperation
Cooperation enhances sustainable water use
6.4 water use efficiency & sustainable withdrawal & supply
2.3 Zero hunger
Lack of long term planning
AGRICULTURAL USE
INDUSTRIAL USE
Lack of efficient coordination bodies
Limited decentralization
Limited involvement of the private sector
11.5 Sustainable cities and communities
Equitable water allocation benefitting the people with less access to water (less conflicts, solidarity and human rights)
6.4 water use efficiency & sustainable withdrawal & supply
TREATMENT
COLLECTION
1.5 No poverty
2.4 Zero hunger
6.2 Access to sanitation and hygiene
Deeply rooted social conventions
Safe reuse of treated wastewater decreases water withdrawal
Lack of minimal standards or lack of enforcement
Efficient water use decreases wastewater treatment
6.3 wastewater treatment and recycling
Complementary steps of the sanitation chain
EXPLANATION:
Water cycle
Nutrient cycle
SDG 6 targets
Interdependencies between SDG 6 targets
Other SDG Goals
Challenges

CHALLENGES IN ACHIEVING SDG 6

Once the relevant stakeholders have collectively created a common understanding of the system and its internal and external interdependencies, the *enabling environment* factors which are inhibiting the achievement of the SDG 6 can be identified (challenges illustrated with red boxes in the graphic on the previous page [14]), so that appropriate interventions in the system can be planned.

During the collective exercise, analysing the enabling environment revealed that...

...in rural Tanzania, the major challenges towards achieving the SDG 6 are related to poor coordination, low domestic financing capacity, limited business opportunities, conservative social conventions opposed to change processes, excessive centralization and limited involvement of the private sector in service provision. **In urban Tanzania,** the barriers towards achievement of SDG 6 are low investments, absence of adapted pro-poor financing mechanisms, inadequate minimum standards and illegal practices in faecal sludge management.

...in Macedonia, aging infrastructure and poor operation and maintenance result in important water losses, and the poor monitoring of water-use efficiency makes it difficult to set normative thresholds for non-revenue water in drinking water supply.

Furthermore, government's commitment to reform the sector and raise water tariffs to cover production costs is insufficient. Enforcing the existing laws and regulations in industrial and agricultural use is difficult because of lack of relevant data on water withdrawal.

...in Haiti, the main challenges to rehabilitating degraded watersheds and improving access to water, sanitation and hygiene (WASH) services include:

a) The absence of effective national mechanisms for water sector investment and accountability (i.e. environmental laws and their enforcement are inadequate or absent)

b) Inadequate capacities to implement local level works, including limitations on the expertise of construction firms and the reach of government technical services to assure quality control;

c) Low confidence in water management services and community-based operation and maintenance services (especially for sanitation); and

d) A lack of government vision and investment to address WASH and watershed management together; while water sector investment depends almost 100% on overseas development assistance.

[14] Please note that this graphic is only an example of how the water and sanitation system could look like. Each context might feature different challenges depending on the stakeholders' understanding.

TOWARDS IMPLEMENTATION OF SDG 6

Once the challenges have been identified and agreed upon by the relevant stakeholders, the attention shifts towards the implementation of SDG 6. The next and final step in coming up with an inclusive development agenda is to identify appropriate and practical solutions for tackling those challenges.

Coming up with practical implementation measures: The assessment and development of practical solutions for implementing SDG 6 on the programme, project and business level requires looking into the enabling environment once more.

The enabling environment comprises finance, technology, capacity-building, trade, policy and institutional coherence, multi-stakeholder partnerships, as well as data, monitoring and accountability. These building blocks are mutually reinforcing and interdependent. Experience shows that for example the timely investment in technology and infrastructure is essential and needs to be backed by institutional arrangements. Financing mechanisms, too, are only possible when accompanied by effective governance, enhanced capacities and properly adapted technologies, as well as appropriate tariff systems and legal and regulatory frameworks. UN Water has published a compilation of the most relevant enabling environment factors for the implementation of SDG 6. [15]

Practical implementation needs proper planning:

The most well-defined agenda will not lead to its desired impact unless taken up on the policy level and operationalised on the programme and project level. For this purpose, the results of the previous steps of the stakeholder workshop need to be summarized into a strategy document and taken up in a collective action plan for the involved stakeholders. The action plan reflects the various scopes of action of the involved stakeholders.

The results of the 2016 AGUASAN workshop include strategy papers for the three example countries Haiti, Macedonia and Tanzania and can be downloaded at www.aguasan.ch.

Action plans for the implementation of those strategies are currently being developed with the relevant stakeholders in Haiti, Macedonia and Tanzania. For more information, please contact seecon international gmbh.

[15] Source: UN Water (2015b)

Sources and further readings

Implementing the Water Goal – SDG in practice (2016): Results from the 32nd AGUASAN Workshop, AGUASAN Community of Practice, http://www.aguasan.ch/ws2016/AGUASAN-Workshop-Report_2016.pdf

The SSWM Toolbox (n.y.): Understand your system, seecon international gmbh, www.sswm.info

UN Water (2015a): SDG 6 Infographics, http://www.unwater.org/publications/publications-detail/en/c/292840/

UN Water (2015b): Means of Implementation - a focus on SDG 6 and 17, http://www.unwater.org/publications/publications-detail/en/c/284949/

UN Water (2016a): Monitoring Water and Sanitation in the 2030 Agenda for Sustainable Development, http://www.unwater.org/publications/publications-detail/en/c/379864/

UN Water (2016b): Integrated Monitoring Guide for SDG 6, http://www.unwater.org/publications/publications-detail/en/c/434399/

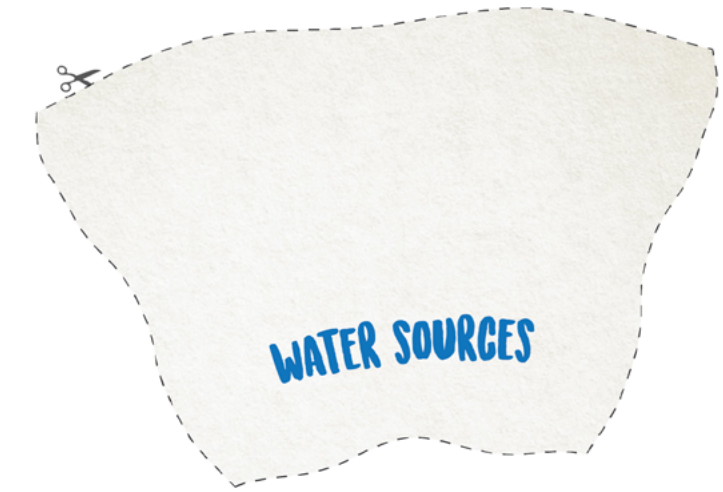
UN Water (2016c): Water and Sanitation Interlinkages across the 2030 Agenda for Sustainable Development, http://www.unwater.org/publications/publications-detail/en/c/429651/

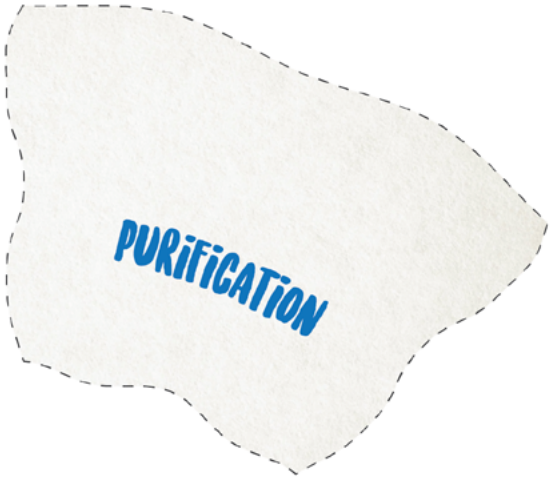
United Nations (n.y.): Sustainable Development Goal 6, Sustainable development knowledge platform, https://sustainabledevelopment.un.org/sdg6

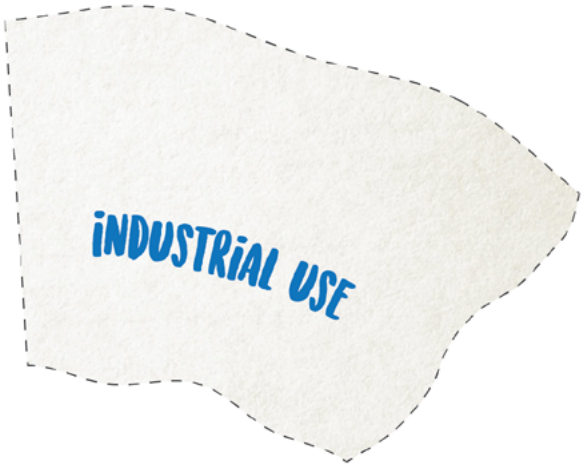
Workshop material:
Puzzle of the water and nutrient cycles

PUZZLE

INSTRUCTIONS: 1. CUT OUT THE PUZZLE PIECES ON THE DOTTED LINES
2. LET YOUR TARGET GROUPS ASSEMBLE THE PUZZLE AS THEY SEE FIT







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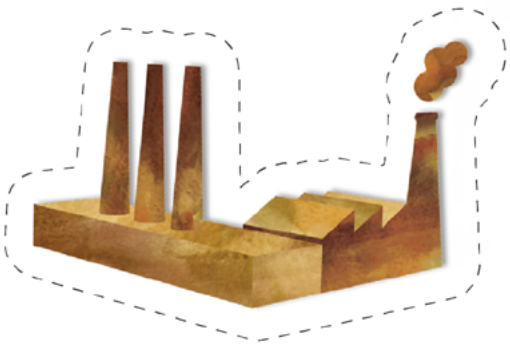
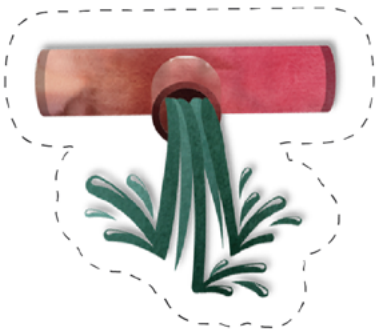
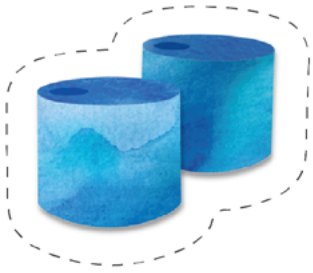
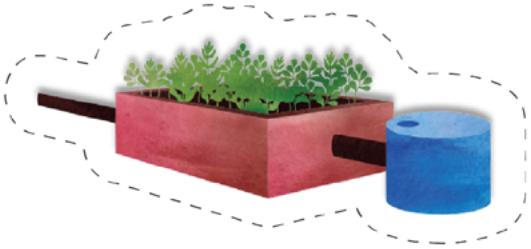
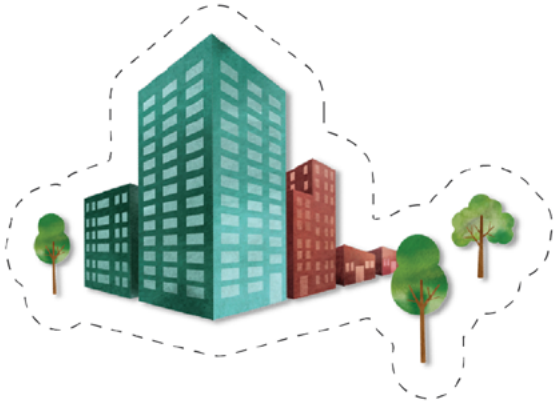
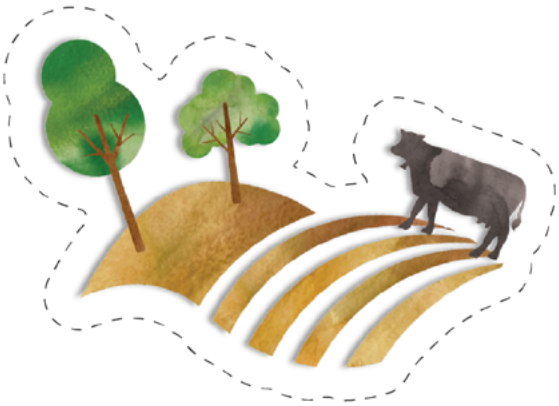




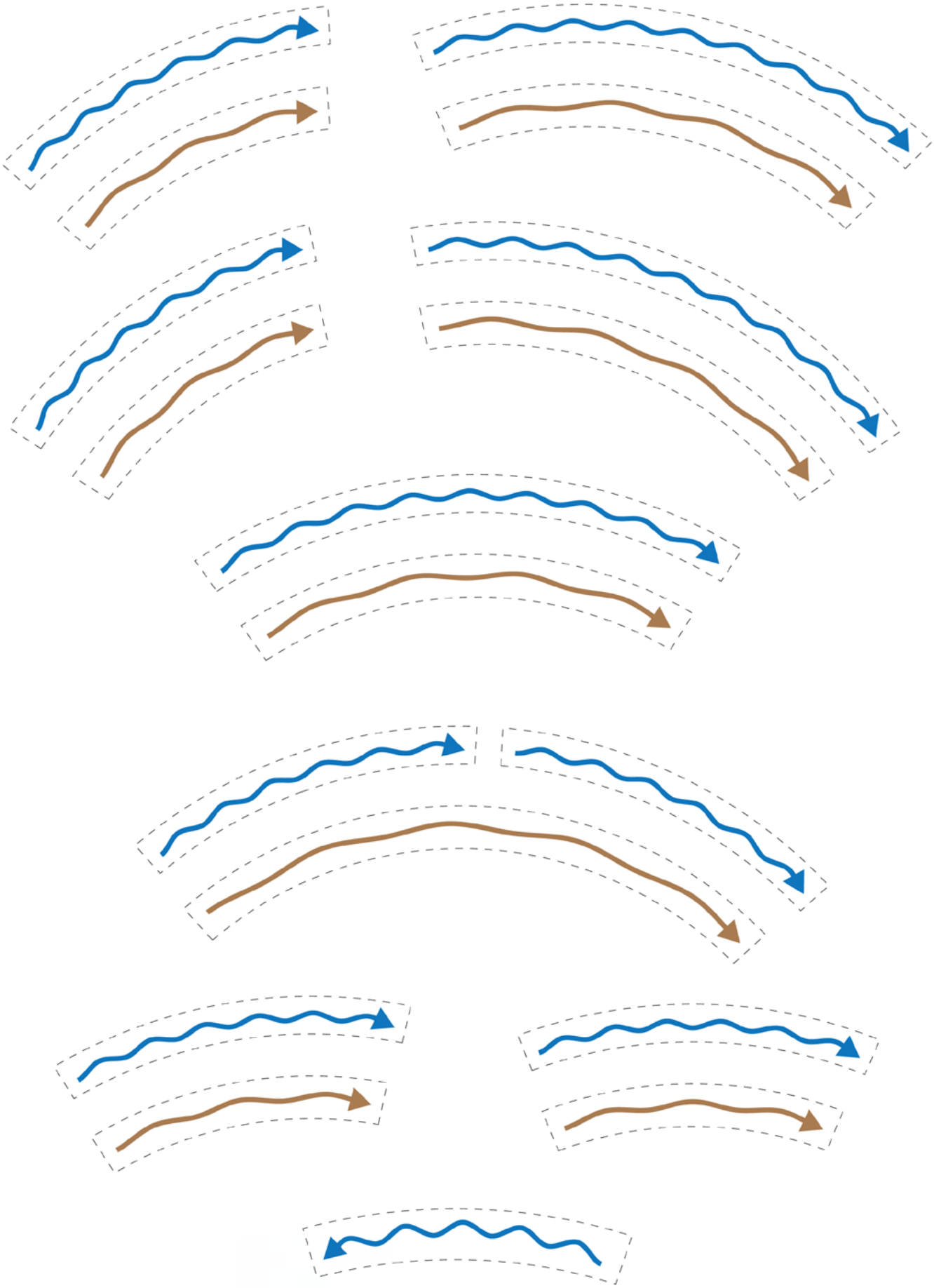








INSTRUCTIONS: 1. CUT OUT THE PUZZLE PIECES ON THE DOTTED LINES
2. LET YOUR TARGET GROUPS ASSEMBLE THE PUZZLE AS THEY SEE FIT



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SDG 6 ALONG THE WATER AND NUTRIENT CYCLES