



Horizon 2020 Societal challenge 5
Climate action, environment, resource
Efficiency and raw materials

D8.2: PLAN TO COORDINATE AND CREATE SYNERGIES WITH MAGIC AND OTHER RELEVANT EU PROJECTS AND INITIATIVES

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2		25-11-2016	COMMENTS RECEIVED FROM INTERNAL REVIEWER (E-MAIL: 25.11.2016: 9.29 AM). THE COMMENTS REQUEST TO CLARIFY THE LINK WITH MAGIC, AND ADD MORE INFORMATION ON DAFNE AND THE NSF INVESTMENTS IN USA.
3		29-11-2016	MARIA WITMER (PBL) TO ADD CD LINKS AND JANEZ SUSNIK (UNESCO-IHE) TO ADD IWC PROJECT.

			MARIA WITMER TO ADD OTHER INTERNATIONAL ACTIVITIES RELEVANT TO SIM4NEXUS
4		30-11-2017	RESUBMISSION AFTER REVIEW IN RP1. FINAL REPORT UPDATED ACCORDING TO 1 ST YEAR REVIEW RECOMMENDATIONS

Version 4 of the report follows from the comments of the project reviewers, received on 12 October 2017. The table below illustrates how the comments have been addressed.

Review comments 12/10/2017	Adjustments in report
<p>The planned activities for synergies with MAGIC need to be updated and elaborated in a more concrete way; e.g. the approach for developing the common case study (or studies), Joint science event, outreach in major climate change events and Joint communication strategy.</p>	<p>Section 2.4 (Develop a common case study) is extended with a last sentence on follow-up.</p> <p>Section 2.6 (Outreach in major climate change events) is extended with a sentence planning for contributions to future events.</p> <p>MAGIC terminated its involvement in and joint lead of the Water-Food-Energy-Biodiversity Nexus Working Group of WssTP. Links between SIM4NEXUS and MAGIC related to WssTP are therefore removed in this deliverable. The previous section 2.2 (Nexus working group of WssTP) is removed from the deliverable.</p>
<p>An overview of the planned activities for synergies with all mentioned projects/initiatives with indicative timing is recommended.</p>	<p>Sections 3.3 and 3.4 are updated with joint actions between SIM4NEXUS and DAFNE, including a tentative timeline.</p> <p>Section 6 (ICT4WATER Cluster) includes an explanation of the communication and dissemination actions of SIM4NEXUS.</p> <p>Section 8.3 (Follow-up with international Nexus-related projects) is added to plan for regular participation in international conferences on the Nexus.</p> <p>Section 9 (Concluding remarks) includes first steps on the clustering of Nexus-related projects.</p>

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Executive summary

The primary objective of the deliverable is to coordinate and to create synergies with other projects, funded under H2020 or from other sources. We focus to align up with MAGIC, the H2020 project on the Nexus funded under the same topic. The coordination and creation of synergies covers:

- Regular information on each project (invitation to meetings, participation in the Advisory Board, etc.).
- Joint participation to meetings upon request of the European Commission to promote the outputs of the projects.
- Potential alignment of activities (especially dissemination and communication activities, i.e. joint policy recommendations) and meetings.
- Exchange and consolidation of results, when relevant.

SIM4NEXUS will also consider other relevant EU projects and initiatives, and develop mutually beneficial synergies.

Synergies are actions towards a common 'path' between different projects/organizations/people. Such actions could include exchange of information, common activities and actions, common sessions in conferences and joint papers, and eventually joint participation in calls for research.

- Collaborative actions with MAGIC (Moving Towards Adaptive Governance in Complexity: Informing Nexus Security). These activities enable us to initiate a European policy workshop on the nexus, develop a common case study and propose a science event on the nexus.
- DAFNE project, proposing a decision-analytic framework to explore the water-energy-food NEXus in complex and transboundary water resources systems of fast growing developing countries. SIM4NEXUS and DAFNE plan to interact and possibly implement joint activities. A follow-up action is defined for the end of 2016.
- PRIMA Initiative, to reinforce cooperation in Research & Innovation in the Mediterranean Basin, addressing the challenges of sustainable food production and water provision. SIM4NEXUS will link-up to the 4PRIMA Coordination and Support Action (<http://www.prima4med.org/wp/>).
- SIM4NEXUS has also identified other relevant H2020 projects that relate to the Nexus, including CD LINKS (Linking Climate and Development Policies) and ICT4 water cluster, which is a knowledge hub on ICT and Water Management funded under FP7 and H2020 research programmes.
- SIM4NEXUS will seek synergy with a selection of national research initiatives on the Nexus, including 'NeXus of Water, Food and Energy' and 'Interdepartmental Water Cluster' (IWC) in the Netherlands.
- SIM4NEXUS will seek synergy with transnational and global research initiatives on the Nexus, including investments in the Nexus by the National Science Foundation in the US and the Global Land Outlook of the UNCCD.

EASME has mapped projects that cover part of the Nexus dimensions. SIM4NEXUS is interested to support such initiatives and create synergies with them to work on the Nexus of water, land, food, energy and climate. We trust they contribute to improve efficiency in using scarce resources in Europe and elsewhere.

Changes with respect to the DoA

No changes with respect to the DoA.

Dissemination and uptake

The deliverable will be released on the project website. In addition, we will follow-up with the projects we plan to co-ordinate our activities.

Short Summary of results (<250 words)

Synergy are the actions towards a common 'path' between different projects, organisations and people. SIM4NEXUS has identified several projects and activities we coordinate and create synergies. This includes exchange of information, common activities and actions (e.g. sessions in conferences).

Evidence of accomplishment

Report.

Glossary / Acronyms

TERM	EXPLANATION / MEANING
CAP	COMMON AGRICULTURAL POLICY
CBD	CONVENTION ON BIOLOGICAL DIVERSITY
CD LINKS	LINKING CLIMATE AND DEVELOPMENT POLICIES – LEVERAGING INTERNATIONAL NETWORKS AND KNOWLEDGE SHARING
COP	CONFERENCE OF THE PARTIES
CSA	COORDINATION AND SUPPORT ACTION
DAF	DECISION-ANALYTIC-FRAMEWORK
DAFNE	USE OF A DECISION-ANALYTIC FRAMEWORK TO EXPLORE THE WATER-ENERGY-FOOD NEXUS IN COMPLEX AND TRANS-BOUNDARY WATER RESOURCES SYSTEMS OF FAST GROWING DEVELOPING COUNTRIES
DTU	DANISH TECHNICAL UNIVERSITY
EAB	EXTERNAL ADVISORY BOARD
EGU	EUROPEAN GEOSCIENCES UNION
EPFL	ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
EASME	EXECUTIVE AGENCY FOR SMALL AND MEDIUM-SIZED ENTERPRISES
ETP	EUROPEAN TECHNOLOGY PLATFORMS
FP7	7 TH FRAMEWORK PROGRAMME FOR RESEARCH AND TECHNOLOGICAL DEVELOPMENT
GLO	GLOBAL LAND OUTLOOK
ICTA	INSTITUTE OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY (IN UAB)
INFEWS	INNOVATIONS AT THE NEXUS OF FOOD, ENERGY AND WATER SYSTEMS
IWC	INTERDEPARTMENTAL WATER CLUSTER
MAGIC	MOVING TOWARDS ADAPTIVE GOVERNANCE IN COMPLEXITY: INFORMING NEXUS SECURITY
MUSIASSEM	MULTI-SCALE INTEGRATED ANALYSIS OF SOCIETAL AND ECOSYSTEM METABOLISM
NSF	NATIONAL SCIENCE FOUNDATION
NTUA	NATIONAL TECHNICAL UNIVERSITY OF ATHENS

PBL	NETHERLANDS ENVIRONMENTAL ASSESSMENT AGENCY
PRIMA	PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA
SDG	SUSTAINABLE DEVELOPMENT GOAL
UAB	AUTONOMOUS UNIVERSITY OF BARCELONA
UNCCD	UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION
UNFCCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
WEF	WATER-ENERGY-FOOD
WFD	WATER FRAMEWORK DIRECTIVE
WSSTP	WATER SUPPLY AND SANITATION TECHNOLOGY PLATFORM

1 Introduction

1.1 Structure of the document

The report presents an overview of the activities and actions to coordinate and to create synergies with other projects, funded under H2020 or from other sources. We focus to align up with MAGIC, the H2020 project on the Nexus funded under the same topic. The coordination and creation of synergies covers:

- Regular information on each project (invitation to meetings, participation in the Advisory Board, etc.).
- Joint participation to meetings upon request of the European Commission to promote the outputs of the projects.
- Potential alignment of activities (especially dissemination and communication activities, i.e. joint policy recommendations) and meetings.
- Exchange and consolidation of results, when relevant.

SIM4NEXUS will also consider other relevant EU projects and initiatives, and develop mutually beneficial synergies.

Chapter 2 presents the collaborative actions with MAGIC (Moving Towards Adaptive Governance in Complexity: Informing Nexus Security). They are mainly initiated through the participation in the Advisory Boards of the two projects. These activities enable us to initiate a European policy workshop on the nexus, develop a common case study and propose a science event on the nexus.

DAFNE is another H2020 project, proposing a decision-analytic framework to explore the water-energy-food NEXUS in complex and transboundary water resources systems of fast growing developing countries. *Chapter 3* clarifies how SIM4NEXUS and DAFNE plan to interact and possibly implement joint activities. A follow-up action is defined for the end of 2016. *Chapter 4* presents the PRIMA Initiative, to reinforce cooperation in Research & Innovation in the Mediterranean Basin, addressing the challenges of sustainable food production and water provision. SIM4NEXUS will link-up to the 4PRIMA Coordination and Support Action (<http://www.prima4med.org/wp/>). Similarly, SIM4NEXUS has also identified other relevant H2020 projects that relate to the Nexus, including CD LINKS (*Chapter 5*) and ICT4 water cluster (*Chapter 6*). SIM4NEXUS will seek synergy with a selection of national research initiatives on the Nexus (*Chapter 7*), including 'NeXus of Water, Food and Energy' (Section 7.1) and 'Interdepartmental Water Cluster' (IWC) in the Netherlands (Section 7.2), as well as transnational and global research initiatives on the Nexus (*Chapter 8*), including investments in the Nexus by the National Science Foundation in the US (Section 8.2) and the Global Land Outlook of the UNCCD (Section 8.3).

2 MAGIC

SIM4NEXUS and MAGIC are the two H2020 projects on the Nexus from Water-2b-2015 - Integrated approaches to food security, low-carbon energy, sustainable water management and climate change mitigation. MAGIC (Moving Towards Adaptive Governance in Complexity: Informing Nexus Security) is coordinated by the Institute of Environmental Science and Technology (ICTA) of the Autonomous University of Barcelona (UAB) in collaboration with partners which have a proven and track record in their respective fields of competence.

The objective is to open the path towards a new way of managing the Nexus in which researchers and decision makers work together in the search for development strategies that can contribute to the smart, sustainable and inclusive economic growth required by the EU 2020 Strategy, while maintaining a leading and informed participation in international discussions about global issues, like climate change or food security.

MAGIC is a process-oriented project: dealing with complexity and uncertainty, and offering a deliberation support system. The approach used in MAGIC is quantitative story-telling, which is an approach to the construction and verification of narratives that frame the development of policies and innovations. The MuSIASEM framework is used, a Multi-Scale Integrated Analysis of Societal and Ecosystem Metabolism. In order to do so, MAGIC deploys a set of novel, cutting-edge and system-oriented approaches that originates from system ecology, bio-economics and Science and Technology Studies. Their combination allows MAGIC to highlight if a certain mix of EU policies results in undesirable or unforeseen outcomes. Climate, water, land energy, and food modelling are integrated into a socio- and bio-economics framework using an iterative and participatory method. Significant care is taken to embed these ideas and approaches within the advisory and decision making functions of the European Commission.

The impacts are twofold.

- First, MAGIC contributes a methodological framework where the needs for advice of different DG in the design of development strategies for the EU are covered using a method that can embrace the complexity of the nexus, for a better understanding of the interactions it holds.
- Second, the project provides 'on the flight' advice to the EC about the timeliness and soundness for the EU 2020 Strategy and the EU position in international agreements of EU policies -like the Water Framework Directive (WFD), the Common Agricultural Policy (CAP), or the Low-Carbon Economy Strategy- and targets of implementing technologies - such as fracking, desalination, biofuels and GMOs.

MAGIC has 9 partners from 7 countries.

2.1 Membership of the two Advisory Boards

Mario Giampietro (ICREA Research Professor) (Institute of Environmental Science and Technology, ICTA) and Project Coordinator of MAGIS is member of the External Advisory Board (EAB) of SIM4NEXUS. The EAB consists of experts independent from the consortium. The EAB will be active for the duration of the project. The role of the EAB will be to provide direct feedback on the project interim and final results and to share relevant information about related studies and initiative with which they are involved. It will be invited to develop relevant ideas with the project team and to ensure linkages with stakeholders and contacts with key actors in the field of policy and decision-making related to water, food, energy, land and climate change. Throughout the project these linkages will be important for information dissemination. The EAB will convene 3 times in a regular meeting: a meeting around the end of year 1 (to present the first results and the planning); a mid-term meeting (to assess the direction of the project and the achievements made); a meeting to advise on the final phase and focus on the exploitation and business of SIM4NEXUS. In addition, the members of the EAB will be consulted for ad-hoc advice and reviews. The EAB will meet three times: M12 (May 2017), M24 (May 2018) and M36 (May 2019). Floor Brouwer (scientific co-ordinator in SIM4NEXUS) will join the Advisory Board of MAGIC and participate at its first meeting in May 2017 in Wageningen (the Netherlands), as part of the first progress meeting.

2.2 European policy workshop on the Nexus

A joint workshop on the Nexus in Europe will be organised by the two projects. The first workshop is scheduled for November 2017, and we jointly seek for the active involvement of the water industry. A possible topic would be the Nexus in a low-carbon economy in Europe.

2.3 Develop a common case study

SIM4NEXUS and MAGIC will develop a common case study, from the 12 case studies identified in SIM4NEXUS. MAGIC will select its case studies during the first year of the project, with the input from EC policy makers. We envisage to choose at least one common case, which both projects will elaborate independently by applying their different approaches and methods. Once the scope is identified, we will follow-up with MAGIC to discuss the approach they adopt. The two projects will adopt their own methodology and approach, comparing the outcomes at the end. Results will be compared and discussed in a joint paper. This will be the start to develop a common scientific paper. Work will start between M12 and M18. A special issue of a scientific journal can be the outcome of the joint case study as well. Such a special issue would not necessarily be limited to a common case study. Follow-up will start with the case study in the Netherlands. SIM4NEXUS and MAGIC will jointly organise a working session (to be held with WUR-LEI) on 19 February 2018 to share progress and discuss follow-up.

2.4 Science event on the Nexus

A science event on the Nexus will be held, among others, with contributions from the External Advisory Board (EAB). This could be the start to launch a Special Issue of a Journal. Such an event could be held in 2018, in fact Year 3 of the two projects. We seek to align with a conference.

2.5 Outreach in major climate change events

Both projects will regularly check within their consortium for relevant contacts to organize climate change related activities, such as the Sessions of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), or IPCC meetings. SIM4NEXUS has contributed to a side-event on the Nexus during COP23 (11 November 2017, Bonn), together with the Nexus project IS-WEL (Integrated Solutions for Water, Energy, and Land project). We plan to propose other side-events on the Nexus during upcoming climate change events.

2.6 Joint communication strategy on the Nexus

Some discussions to align dissemination and communication activities in the two projects. SIM4NEXUS and MAGIC could launch a joint twitter and social media campaign along the joint activities, through @SIM4NEXUS and @MAGIC_NEXUS.

3 DAFNE

3.1 Objective

DAFNE (Use of a Decision-Analytic Framework to explore the water-energy-food NEXus in complex and transboundary water resources systems of fast growing developing countries) is a H2020 project in WATER-5c-2015 – Development of water supply and sanitation technology, systems and tools, and/or methodologies.

Global trends in population growth and rising economic prosperity will increase the demand for energy, food and water, with more severe impact in fast-growing economies, such as in several African countries. The constraints on water, energy, and food could well hamper economic development, lead to social and geopolitical tensions, and cause lasting environmental damage. DAFNE advocates an integrated and adaptive water resources planning and management approach that explicitly addresses the water-energy-food (WEF) nexus from a novel participatory and multidisciplinary perspective. This includes social, economic, and ecologic dimensions, involves both public and private actors and is socially inclusive, enhances resource efficiency and prevents the loss of ecosystem services in regions where large infrastructures exist or are being built and intensive agriculture is expanding. A decision-analytic-framework (DAF) will be developed to quantitatively assess the social, economic, and

environmental impact of expanding energy and food production in complex physical and political contexts, where natural and social processes are strongly interconnected and the institutional setting involves multiple stakeholders and decision-makers. The DAFNE approach will be demonstrated by analysing two cross-boundary case studies, the Zambezi and the Omo river basins. The WEF nexus will be quantified and analysed as the trade-off between conflicting objectives such as hydropower production vs irrigation, land exploitation vs conservation, etc. The nexus will be translated in economic values and impact on growth, ecosystems and ecosystem services. DAFNE will allow a better understanding of the WEF nexus, and generate and explore alternative planning and management solutions based on the cooperation of public and private stakeholders, which foster the profitable but equitable use of resources without transgressing environmental limits or creating societal and/or stakeholder conflicts.

3.2 Interaction with SIM4NEXUS

DAFNE is coordinated by Paolo Burlando (ETH, Zürich, Switzerland). Andrea Castelletti (Milan) is deputy co-ordinator. Following the suggestion by Lydia Vamvakeridou (UNEXE), Floor Brouwer (WUR-LEI) had a Skype conversation with the co-ordinator of DAFNE on October 6. It was agreed to follow-up with a few persons from both projects. Chrysi Laspidou (UTH), Lydia Vamvakeridou (UNEXE) and Floor Brouwer (WUR-LEI) had a Skype conversation with Paolo Burlando and Andrea Castelletti on October 18, 2016. DAFNE has two case studies, one along the Omo river basins between Ethiopia and Kenya, where dams are planned, with a high potential for conflicts. The other case is in Mozambique and Zambia, which is a well-established case study and much larger in scale than the one in Ethiopia and Kenya. This case is covering the Zambesi river, with many more countries and there is a management plan. However, the region faces climate change and food security as major issues of concern.

3.3 Possible joint activities

1. A special session at a scientific event

SIM4NEXUS and DAFNE will jointly seek for a joint session on the science of the Nexus, possibly during the EGU (European Geosciences Union) conference in Vienna, which is going to be held in 8 – 13 April 2018. Submission of abstracts is between October 2017 and 10 January 2018. DAFNE will develop a methodological framework, also considering the involvement of all actors in the domain of water resources. The two projects adopt a transdisciplinary approach, which increases the opportunities for scientific publications. We consider to develop a special issue in a journal. The focus of such a special issue remains to be defined, but could certainly link-up to other activities in SIM4NEXUS.

2. Comparative work from the case studies

Both SIM4NEXUS and DAFNE implement transboundary case studies regarding the Nexus. The transboundary cases focus at major rivers in Europe and Africa (Rhine, Elbe, Zambesi). We will further explore the opportunities to compare the approaches in the context of transboundary issues.

Following initial contacts between DAFNE and SIM4NEXUS during the first 18 months, we identified some additional joint clustering activities. Clustering activities are aimed to strengthen joint scientific output, boost science-policy interaction at national, European and international level, and align-up with the business sector. The clustering activities are targeted at:

- Strengthen comparative work from Nexus-related actions in Europe and Africa, including multi-stakeholder interaction and science-policy events in Brussels (e.g. DG ENV, DG CLIMA, DG DEVCO, DG AGRI, DG ENERGY)
- Strengthen interaction between the knowledge partners and the business sector (e.g. Nexus Working group in WssTP, the European Water Technology Platform). SIM4NEXUS and DAFNE meet during the meetings of the Working Group (e.g. Water Knowledge Europe, annual events in Brussels held in November; Water Innovation Europe, annual events in Brussels held in June). The two projects consider to jointly organise a European policy workshop on the Nexus.

- Boost policy support from combined efforts of policy briefs and joint scientific publications. We will try to connect the joint policy briefs with SDGs of Agenda 2030. ICRE8 is the hosting institution of UN Sustainable Development Solutions Network and has excellent contacts with SDSN Global at Earth Institute of Columbia University, and of course their European Headquarters in Paris.
- SIM4NEXUS and DAFNE will develop comparative case study work (e.g. transboundary case in Europe and a transboundary case in Africa) and seek for a joint paper.
- SIM4NEXUS and DAFNE will together launch scientific events on the Nexus (e.g. through joint actions around project meetings and a joint summer school towards the end of the two projects).

3.4 Follow-up

The two projects will plan for follow-up during the SIM4NEXUS Project meeting, which planned to be held in Athens, March 2018. This is meant to explore implementation of joint activities.

4 PRIMA Initiative

The PRIMA initiative (Partnership for Research and Innovation in the Mediterranean Area) was launched in 2013 under the European Commission's Research and Innovation (R&I) agenda. Its objective is to reinforce cooperation in R&I in the Mediterranean Basin towards contributing to the challenges of sustainable food production and water provision. It is the first time that such a long-term and wide program includes both European (Cyprus, France, Greece, Italy, Luxembourg, Malta, Portugal, Czech Republic, Spain) and non-European member states (Egypt, Jordan, Lebanon, Morocco, Tunisia and Turkey). A total of 400 million euros has been committed for the initiative over a 10-year period starting in 2018. Additional countries interested into PRIMA are in the process of joining as Germany, Turkey, Romania and Israel.

PRIMA focuses in the Mediterranean, where the Water-Food-Energy Nexus is of importance whilst crucial actions are needed to ensure economic and social development due to the natural and political context. PRIMA aims at developing innovative solutions and promote their adoption for improving efficiency and sustainability of food production and water provision to supporting an inclusive well-being and socio-economic development within the framework of a reinforced Euro-Mediterranean co-operation.

Two intentions will drive the PRIMA Initiative towards achieving this goal:

- advance existing knowledge and innovations for water management, food security, and food quality through long-term cooperation
- adoption of knowledge and unlocking innovation potential through end user-friendly and socially affordable solutions.

A 4PRIMA Coordination and Support Action (CSA) was launched on May 2016 and will last for 18 months; it will set the basis and support for long-term, well-structured and integrated partnership for research and innovation on food systems and water resources, between countries on both shores of the Mediterranean (north, south). The CSA will prioritize and valorise the PRIMA proposal objectives where the future PRIMA action release at the end of 2017 will be founded.

EPSILON will possibly respond to PRIMA calls for collaborative projects. SIM4NEXUS might either communicate results and products in the Mediterranean (e.g. training actions) or possibly respond to PRIMA calls for collaborative projects.

5 CD Links

CD Links (Linking Climate and Development Policies – Leveraging International Networks and Knowledge Sharing) brings together a consortium of nineteen leading international research organizations from around the globe to explore national and global transformation strategies for climate change and their linkages to a range of sustainable development objectives. The project is funded under H2020 (see also: <http://www.cd-links.org/>).

An important question for policy makers, in the G20 and beyond, is how to bring climate action into the broader sustainable development agenda. Objectives like energy poverty eradication, increased well-being and welfare, air quality improvement, energy security enhancement, and food and water availability will continue to remain important over the next several decades. There have been relatively few scientific analyses, however, that have explored the complex interplay between climate action and development while simultaneously taking both global and national perspectives.

The CD-LINKS project will change this, filling the critical knowledge gap and providing much-needed information for designing complementary climate-development policies. The project aims to have a pronounced impact on the policy dialogue, both nationally and internationally: an important outcome of the project will be a list of country-specific policy recommendations for effectively managing the long-term transformation process. These recommendations will point out opportunities for policy synergies and at the same time respect political and institutional barriers to implementation.

CD-LINKS will (i) gain an improved understanding of the linkages between climate change policies (mitigation/adaptation) and multiple sustainable development objectives, (ii) broaden the evidence base in the area of policy effectiveness by exploring past and current policy experiences, (iii) develop the next generation of globally consistent, national low-carbon development pathways, and (iv) establish a research network and capacity building platform in order to leverage knowledge-exchange among institutions from Europe and other key players within the G20.

PBL is partner in CD-LINKS, making an inventory of how Integrated assessment models cope with SDG indicators and linkages between the SDGs. and Maria Witmer (lead of WP2 in SIM4NEXUS) will link-up with the two projects.

6 ICT4water cluster

The ICT4Water cluster is a hub of 17 sister projects on ICT and Water Management funded under the FP7 and H2020 European Commission research programmes. As stated in the cluster webpage (<http://ict4water.eu>), ICT and water efficiency is a key policy issue with potential for new research area that includes decision supporting system for the measurement of water quality and quantity including the recycling and water reuse processes. This necessitates increased interoperability between water information systems at EU and national levels and efficiency of water resources management. SIM4NEXUS is very close related to the main interests of the cluster, especially in terms of analysing how policy decisions in the water domain affect to the rest of the Nexus (climate, energy, land and food), and also analysing these issues at different scales (regional, national, transboundary, continental and global). Hence, improving decision support. SIM4NEXUS has been announced in the last edition of the ICT4Water cluster newsletter, including a summary of the project concept, objectives, expected outcomes, duration, partnership and contact information. See: <http://us8.campaign-archive2.com/?u=46ad96ae8c306627be2d57709&id=d19e63b967&e=70caac3021>

Lydia Vamvakeridou (UNEXE) and Gabriel Anzaldi (Eurecat) are part of the ICT4water team and they will coordinate the interaction with SIM4NEXUS.

SIM4NEXUS will communicate the outcomes of the work through the regular events of the ICT4WATER cluster. This includes, among others, the dissemination actions from the European Commission (DG CONNECT) with periodic updates of the Action Plan of the ICT4WATER Cluster. An example is the event, held in Brussels on December 1, 2017.

7 National research initiatives on the Nexus

7.1 NeXus of Water, Food and Energy

The Technical University of Munich (TUM) works in cooperation with the two EuroTech-Universities, the Danish Technical University (DTU) and the École Polytechnique Fédérale de Lausanne (EPFL), as well as with the prestigious National Technical University of Athens (NTUA) and the Colorado School of Mines. The National Science Foundation Engineering Research Center “Reinventing the Nation’s Urban Water Infrastructure” is the cooperation partner of the Colorado School of Mines. The NeXus topic is investigated for the case of the Nile with its issue intensification due to the construction of new water uses by the upstream countries Ethiopia and Tanzania. The African project partners, namely the Addis Ababa University in Ethiopia, the Ardhi University in Tanzania, the Cairo University and the Helwan University in Egypt, are confronted with this potential for conflict in their daily work. See also: <https://www.nexus.wasser.tum.de/index.php?id=5&L=1>.

The project ‘NeXus of Water, Food and Energy’ does promote the mobility for academic staff and students to build a thematic network with strategic goals of enhanced cooperation in the NeXus-education and -research between TU Munich, EuroTech partners from Switzerland and Denmark, NTUA Athens, the National Science Foundation Engineering Research Center ReNUWIt and the partner universities of the Nile Nexus area in Egypt (Cairo and Helwan University), Tanzania (Ardhi University) and Ethiopia (Addis Ababa University). The project goals include the development of an English Master’s degree program in the NeXus field at the TU München. With contacts and through joint Bachelor- and Master-theses the transdisciplinary Nexus research should be initiated in a geographical area, where the subject is especially virulent. The NeXus Master’s degree program will also stand open to all employees of ministries and departments from partner countries with connection to NeXus and shall create lasting contacts of these countries to the TU München. Parallel doctoral programs are provided through funding of the participating partners from the EU/USA.

7.2 Interdepartmental Water Cluster (IWC) – Water Risk Climate and Development

IWC is funded by the Netherlands Ministries of Infrastructure & Environment, Economic Affairs and Foreign Affairs, 2017). Global hotspots analysis of water issues concerning floods, droughts, water quality and pollution, from the viewpoints Prosperity, People, Planet and geoPolitics. PBL leads this project and cooperates with Deltares, University of Utrecht, Institute for Environmental Studies, Wageningen University and Research, UNESCO-IHE, Clingendael. These areas have clear nexus relationships, so the hotspots identified as part of this work will have direct relevance and impact on, for example, food, energy, material flows and climate change. Global hotspots maps will be developed of the current and possible future (2050) situation, applying SSP2 and SSP3 projections. PBL (Elke Stehfest) will link up with this project.

8 Transnational and global research initiatives on the Nexus

8.1 NSF invests in Nexus

The National Science Foundation (NSF) in the US has announced to invest \$72 million in innovations at nexus of food, energy and water systems. Most projects start in the second half of 2016 and will run for three to four years. They have a similar timeline as SIM4NEXUS. The investments are part of the NSF Innovations at the Nexus of Food, Energy and Water Systems program, known as INFEWS. While the complex relationship between energy and water systems has been studied for decades - and agricultural diversions of water date back much farther - how these systems interact has become an area of frontier research. Drought and the depletion of aquifers. Shifts in farming between food and fuel crops. Concerns about food waste and the relentless demand for energy for food production. Food processing and transportation. All of these areas have prompted a deeper and broader examination of the linked food-energy-water system.

The outcomes of the INFEWS investments will help decision-makers at every level better serve human needs and protect the natural world. Scientists and policy-makers will gain a new understanding of food-energy-water systems, gather insights from data and innovative modelling, and develop new capabilities from cutting-edge technologies to reduce waste or increase efficiencies.

INFEWS investments will also prepare graduate students to understand and manage the complex interactions of food-energy-water systems, and to draw upon and integrate knowledge across disciplines. INFEWS investigators will incorporate physical, engineering, geological, biological, social and behavioral processes, as well as cyber elements, into their projects. SIM4NEXUS will identify projects where we might align up. Possible projects include 'Immersive Educational Game Simulations to Enhance Understanding of Corn-Water-Ethanol-Beef System Nexus', University of Nebraska-Lincoln (https://www.nsf.gov/awardsearch/showAward?AWD_ID=1639478), or 'Social-ecological-technological solutions to waste reuse in food, energy, and water systems (ReFEWS)', University of Idaho (https://www.nsf.gov/awardsearch/showAward?AWD_ID=1639524).

8.2 UNCCD Global Land Outlook (GLO)

The GLO will help to sketch future challenges on land in the context of sustainable development, the potential responses available, as well as aiding cohesion with the other conventions – UNFCCC and CBD. See <http://www2.unccd.int/the-global-land-outlook-glo>

Scenario projections on global environmental change are currently limited in their inclusion of the themes relevant for the UNCCD: in accounting for changes in the condition of land, soils and ecosystems and for feedback effects of those changes on agriculture, water, energy and climate regulation. An advisory report to UNCCD noted that the poor understanding of the complexity of feedbacks among climate change, land degradation and biodiversity loss, including the interactions in different social-ecological systems and how this may change in the future “limits our capacity for anticipatory action”. UNCCD identified three land-based progress indicators that relate to all three conventions: trends in land cover; trends in land productivity or functioning of the land; and trends in carbon stocks above and below ground.

At the same time attaining multiple environmental goals, summarized in a number of the Sustainable Development Goals (SDGs) with a 2030 horizon, puts additional claims on land, in terms of its use, functioning, and distribution of ownership and access to it. Key questions here are to what extent land will become a limiting factor in the attaining of land-related SDGs, how the interrelations between land and water, food, and energy influences the possibility to attain the SDGs, and what options there are to bring attainment of land-related SDGs closer. PBL (Elke Stehfest) is involved in the GLO and will link up with the two projects.

8.3 Follow-up with international Nexus-related projects

The Project Coordination Team (PCT) does regularly assess upcoming conferences, both in Europe but also international workshops. We plan for active participation in conferences like Nexus 2018: Water, Food, Energy and Climate. This will be the second Nexus Conference that The Water Institute has organized (April 16-18, 2018). The first in 2014 made a significant input to the negotiations for the Sustainable Development Goals (SDGs), through the Chapel Hill Declaration. SIM4NEXUS has submitted an abstract, and decisions on the acceptance will be made before the end of 2017.

9 Concluding remarks

The Executive Agency for Small and Medium-sized Enterprises (EASME) has performed a Nexus mapping activity of projects that cover part of the Nexus dimensions. SIM4NEXUS is interested to support such initiatives to coordinate and create synergies with such projects to work on the Nexus of water, land, food, energy and climate. We trust they contribute to improve efficiency in using scarce resources in Europe and elsewhere. An overview of Nexus-related projects is going to be presented during the Water Knowledge Europe (WKE2017, WssTP Brokerage Event), with the Nexus working group (30 November 2017). We will identify common challenges and potential synergies between the Nexus projects.