TEMPLATE A

RESPONSE FOR SOLUTIONS: "Space2030" Agenda Mid-term Review

For Member States

NOTE BY SECRETARIAT: the following template is designed to allow Member States of the United Nations and permanent observer organizations with COPUOS to provide standardized responses to any of the 4 Overarching Objectives, and showcase their space solutions

Overarching objective [1-4]	Actions 3, 2
Country/Observer Organization	Bulgaria
Project partners	Mozaika, Ltd Executive Agency for Exploration and Maintenance of the Danube River (EAEMDR), Ministry of Transport and Communications National Electricity Company (NEK), Ministry of Energy
Short Project summary and goals	Design and develop intelligent information infrastructure for monitoring water resources of dams and rivers, covering water balance, snow stock, fairway, river hydrology based on earth observation and AI. Pilot deploy the system at EAEMDR and NEK Projects under PECS Programme of ESA
Relevant SDGs	[6, 3, 2, 1, 9, 11]

Space/Satellite solution:	Data access layer to Earth observation data for meteorological factors, e.g. precipitations (solid and liquid), soil moisture, vegetation index, snow cover, and digital elevation model
Project impact	- Operational efficiency – automatization of routine tasks, de-risking complex tasks - Planning and analytics not practiced before - Disaster response through early warning - Case in point for the utilisation of Earth observation data - Demonstration of the viability of AI methods in the water resources management domain

Reference	Website http://isme-hydro.com Publications: **Mariana Damova, Emil Stoyanov, Stanko Stankov, Hermand Pessek, Hristo Hristov, Plamen Chernev.** Flood Simulation and Forecasting for Sustainable Planning of Response in Municipalities. International Water Conference, Barcelona, Spain, October 2024. Best Presentation Award. **Mariana Damova, Emil Stoyanov, Stanko Stankov, Hermand Pessek, Hristo Hristov, Hristo Enchev, Rumen Stoykov**. ISME-HYDRO: An Intelligent Web-based Workflow for Sustainable Exploitation of Dams and Rivers Based on Earth Observation and AI. 2024 Canadian Dam Association Annual Conference "Navigating the future together", Niagara Falls, Ontario, Canada, September 2024. **Mariana Damova**. Earth Observation and AI for Sustainable Flood Management through Long-term Forecasting and Resource Planning. (Panel presentation). UN Austria Symposium "Climate action: transforming space-based technology projects into sustainable services that support policy-making", Gratz, Austria, June 2024. **Mariana Damova, Stanko Stankov**. Forecasting Discharge with EO4AI Along the Danube River (poster). 2024 Danube Water Forum, Brasov, Romania, May 2024. **Emil Stoyanov**. A Novel Way to Provide Information for Water Resources Management: AI, Earth Observation, Forecasting. World Water Day Conference "Water resources: management, preservation and effective use", Sofia, Bulgaria, March 2024 **Mariana Damova**. Sustainable Exploitation of Dams and Rivers. World Water Day Conference "Water resources: management, preservation and effective use", Sofia, Bulgaria, March 2024.

	Mariana Damova. Intelligent Web-based Workflow with Embedded Early Warning Based on Earth Observation and AI: A Case for Water Resources Management. (poster) UN World Space Forum. Vienna, Austria, December 2023. **Mariana Damova**. Forecasting Discharge and Water Levels of Rivers and Dams using Earth Observation and AI. UNOOSA Third Space4Water Stakeholder Meeting, Vienna, Austria, October 2023. **Mariana Damova, Emil Stoyanov, Stanko Stankov, Hermand Pessek**. An Information e-Infrastructure for Monitoring of Water Resources or Rivers and Dams for Sustainable Exploitation of Dams and Rivers, based on Earth Observation and AI. KosmosBG 2024, Sofia, Bulgaria, September **Stanko Stankov, W. Alexander Breugem, Mariana Damova, Theofano Koutrouveli, Boudewijn Decrop.** TELEMAC Hydrodynamic Models over Time: A Case Study with the Danube. In Proceedings of TUC2023, Karlsruhe, Germany, October 2023. **Mariana Damova, Kostadin Mishev, Giedre Valunaite Oleškeviciene, Chaya Liebeskind, Purificação Silvano, Dimitar Trajanov, Ciprian-Octavian Truica, Elena-Simona Apostol, Christian Chiarcos, Anna Baczkowska**. Validation of Language Agnostic Models for Discourse Marker Detection. In Proceedings of LDK2023, Vienna, Austria, September 2023. **Mariana Damova, Emil Stoyanov, Stanko Stankov, Hermand Pesssek.** Water Resources Management of the Danube with ISME-HYDRO (Poster) 2023 Danube Water Conference. Vienna, Austria, June 2023. **Mariana Damova, Emil Stoyanov, Stanko Stankov, Hermand Pesssek.** Intelligent e-Infrastructure for Sustainable Management and Exploitation of Rivers and Dams based on Earth Observation and AI. New Capabilities and Countries in European Space Conference, ESTEC-ESA, Nordwijk, The Netherlands, May 2023. **Mariana Damova, Emil Stoyanov, Stanko Stankov, Hermand Pesssek.** Early Warning Embedded in

	Intelligent Web-based Workflow for River Monitoring through Earth Observation and AI. EGU General Assembly Conference, Vienna, Austria, April 2023. *cite as:* Damova, M., Stoyanov, E., Stankov, S., and Pessek, H.: Early Warning Embedded in Intelligent Web-based Workflow for River Monitoring through Earth Observation and AI, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-17149, https://doi.org/10.5194/egusphere-egu23-17149, 2023. **Mariana Damova, Stanko Stankov.** Forecasting Discharge and Water Levels of Rivers and Dams using Earth Observation and AI. EGU General Assembly Conference, Vienna, Austria, April 2023. *cite as:* Damova, M. and Stankov, S.: Forecasting Discharge and Water Levels of Rivers and Dams using Earth Observation and AI, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-17141, https://doi.org/10.5194/egusphere-egu23-17141, 2023.

Overarching objective [1-4]	Actions 1.6
Country/Observer Organization	Bulgaria
Project partners	Space Research and Technology Institute at the Bulgarian Academy of Sciences, Southwestern State Enterprise DP-Blagoevgrad, Forest Design SRL, ESA
Short Project summary and goals	As part of the efforts for sustainable management and conservation of forest resources, increasing attention has been paid to the study and documentation of natural disturbances in forests, their causes and scope. The impact of various natural factors (fires, insect pests attacks, tree diseases, extreme weather events, etc.) affects a significant part of Bulgarian forests. Thanks to modern satellite technologies for Earth observation, today we have the opportunity to obtain systematic spatially related information on natural disturbances that have occurred in the entire forest area. The project "Forest disturbance inventory using Remote Sensing – FoReS" aims to demonstrate this potential by adapting and testing methods for creating standardised and verified cartographic information products.
Relevant SDGs	13
Space/Satellite solution:	Analysis of images with medium spatial resolution from Sentinel-1 and Sentinel-2 satellites
Project impact	Formation of standardised and verified information products, namely: • Map of natural disturbances on the territory of the country. • Maps of the extent of damage for individual affected territories. • Maps of the post-fire restoration processes for individual affected territories.
Reference	o4society.esa.int/wp-content/uploads/2023/07/forest-disturbance-inventory-using-remote-sensing-fores.pdf

Overarching objective [1-4]	Actions 1.7
Country/Observer Organization	Bulgaria
Project partners	Space Research and Technology Institute at the Bulgarian Academy of Sciences, Institute of Soil Science "Nikola Poushkarov", Vlaamse Instelling voor Technologisch Onderzoek NV (VITO), ESA
Short Project summary and goals	he "Testing Sentinel-2 vegetation indices for the assessment of the state of winter crops in Bulgaria (TS2AgroBg)" project for the agricultural sector, , pertaining to the effective management of timely information on the distribution and areas occupied by different crops, as well as on their current status and expected yield. Satellite images from "Sentinel-2" and "PROBA-V" are of great benefit in obtaining such data. Within the project, information from these two satellites will be used to generate agriculturally relevant products including: raster layers including biophysical and biochemical parameters of winter wheat crops and assessment maps of their status, mask layers of arable land and maps of the distribution of agricultural crops in Bulgaria.
Relevant SDGs	2

Space/Satellite solution:	Satellite images from “Sentinel-2” and “PROBA-V” are of benefit in obtaining information.
Project impact	The possibility of improving winter wheat yield forecasts obtained with the widely used model for predicting the growth, development and productivity of agricultural crops WOFOST by using data from "Sentinel-2" was studied.
Reference	Kamenova, I., Dimitrov, P. “Evaluation of Sentinel-2 vegetation indices for prediction of LAI, fAPAR and fCover of winter wheat in Bulgaria.” European Journal of Remote Sensing, Taylor and Francis, ISSN:2279-7254, DOI:10.1080/22797254.2020. 1839359, 2021