Visualizing and sharing Geoprocessing Workflows in the AfriAlliance project

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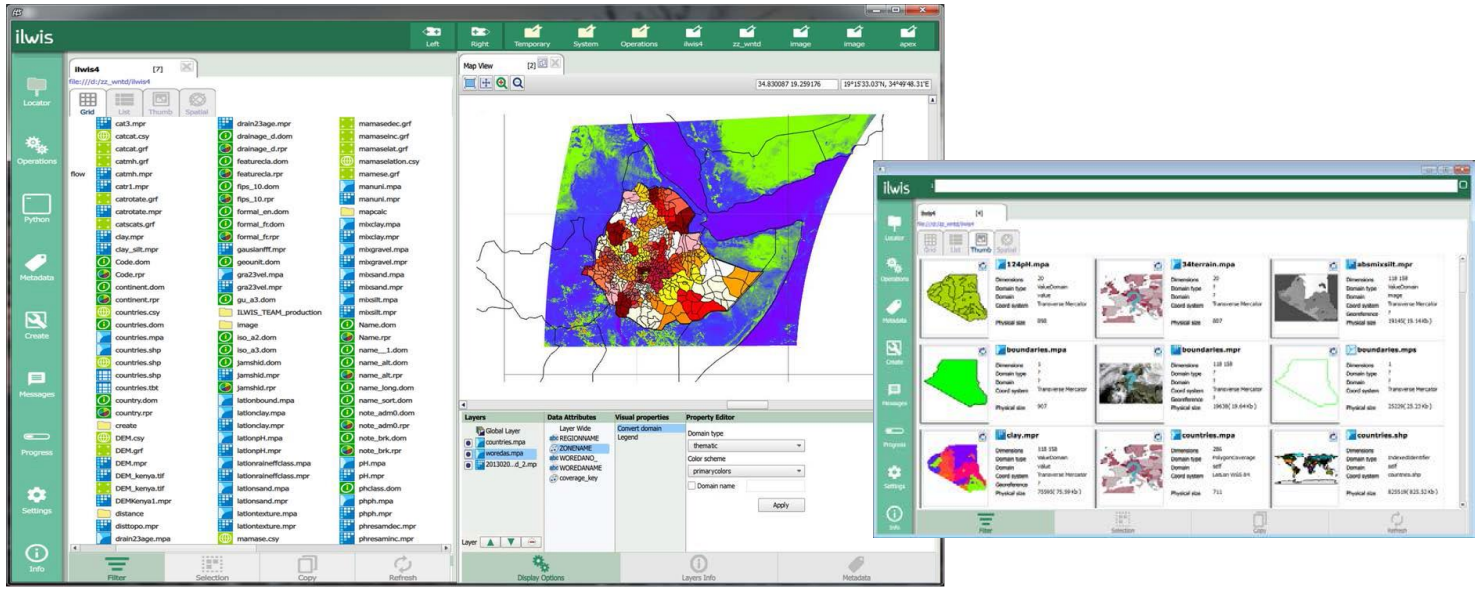
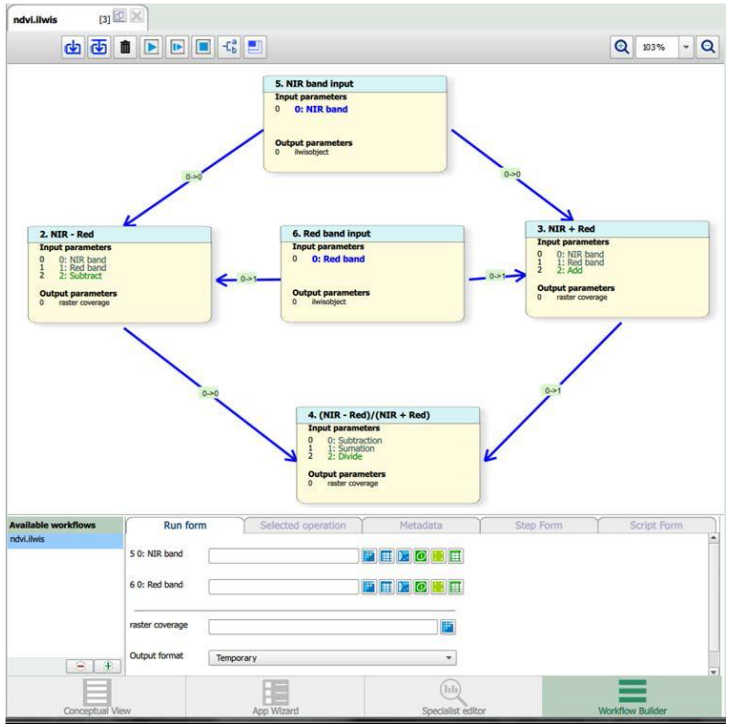
ILWIS: the Integrated Land and Water Information System



Education-friendly interface of ILWIS GIS-EO software: linked-views, visual data catalog, raster metadata view, etc.



Create, debug and share geoprocessing workflows with visual workflow builder

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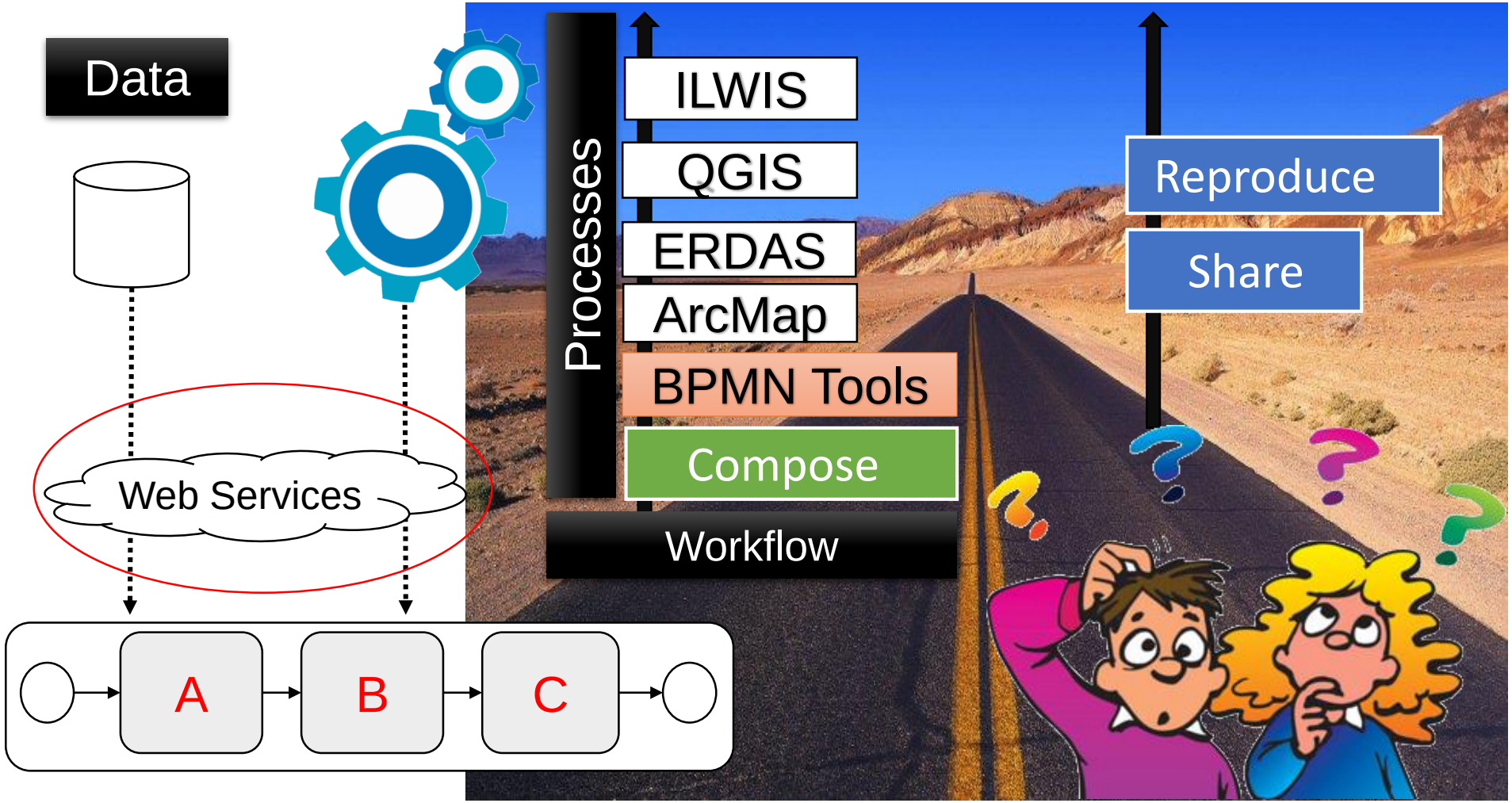
The interoperability issue..



Shareability & Reproducibility

Shareability

Transfer workflow from one user/environment to another.

Requires a standard interchange format.

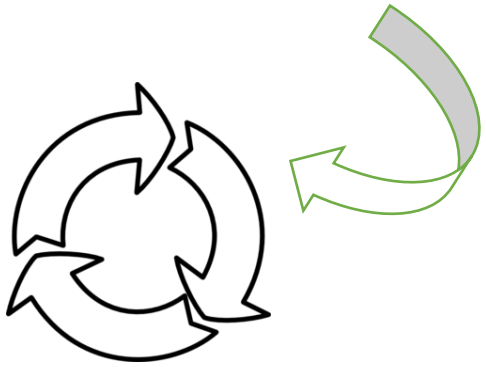
Compose

Reproducibility

Share

Recreate and reuse workflow with same conditions to achieve similar results.

Requires provenance information.

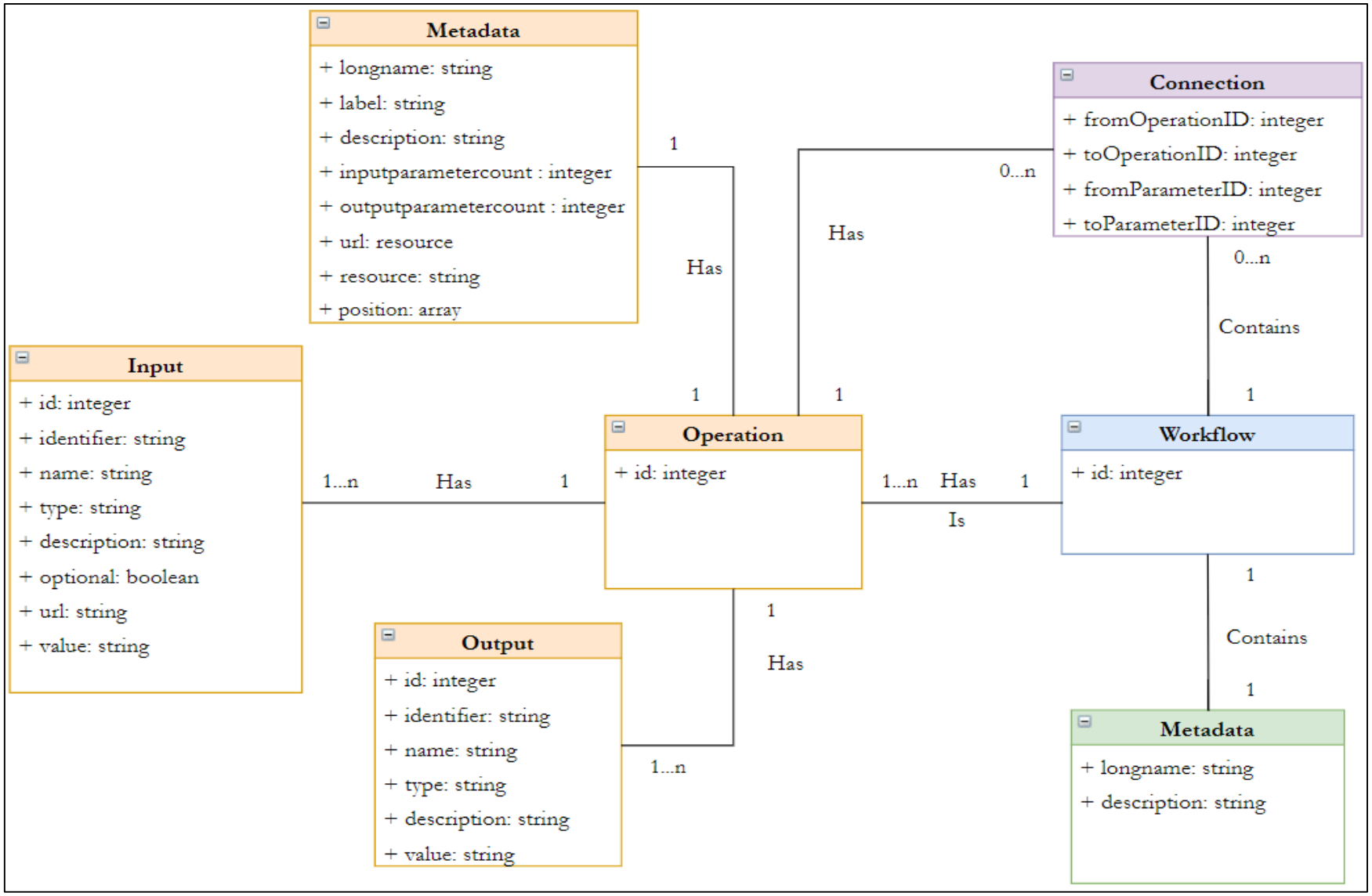


Reproduce

Comparison of workflow systems

Property	ILWIS	QGIS	ERDAS	ArcGIS	BPM tools	OGC GPW	KNIME
Which exchange format is used?	JSON	JSON & XML	JSON	Python	XML	XML	XML
Does the schema of the format conform to a standard?	No	No	No	No	Yes	Yes	No
Is the workflow reproducible from this format?	No	Yes	Yes	No	Yes	Yes	Yes
Does it store enough metadata to describe a process?	Yes	No	Yes	No	-	Yes	-
Does it support workflow composition from remote services?	No	No	No	No	Yes	Yes	No

Schema for standard interchange format



Architecture & implementation

Schema design

Schema implementation

Interface development

Workflow composition

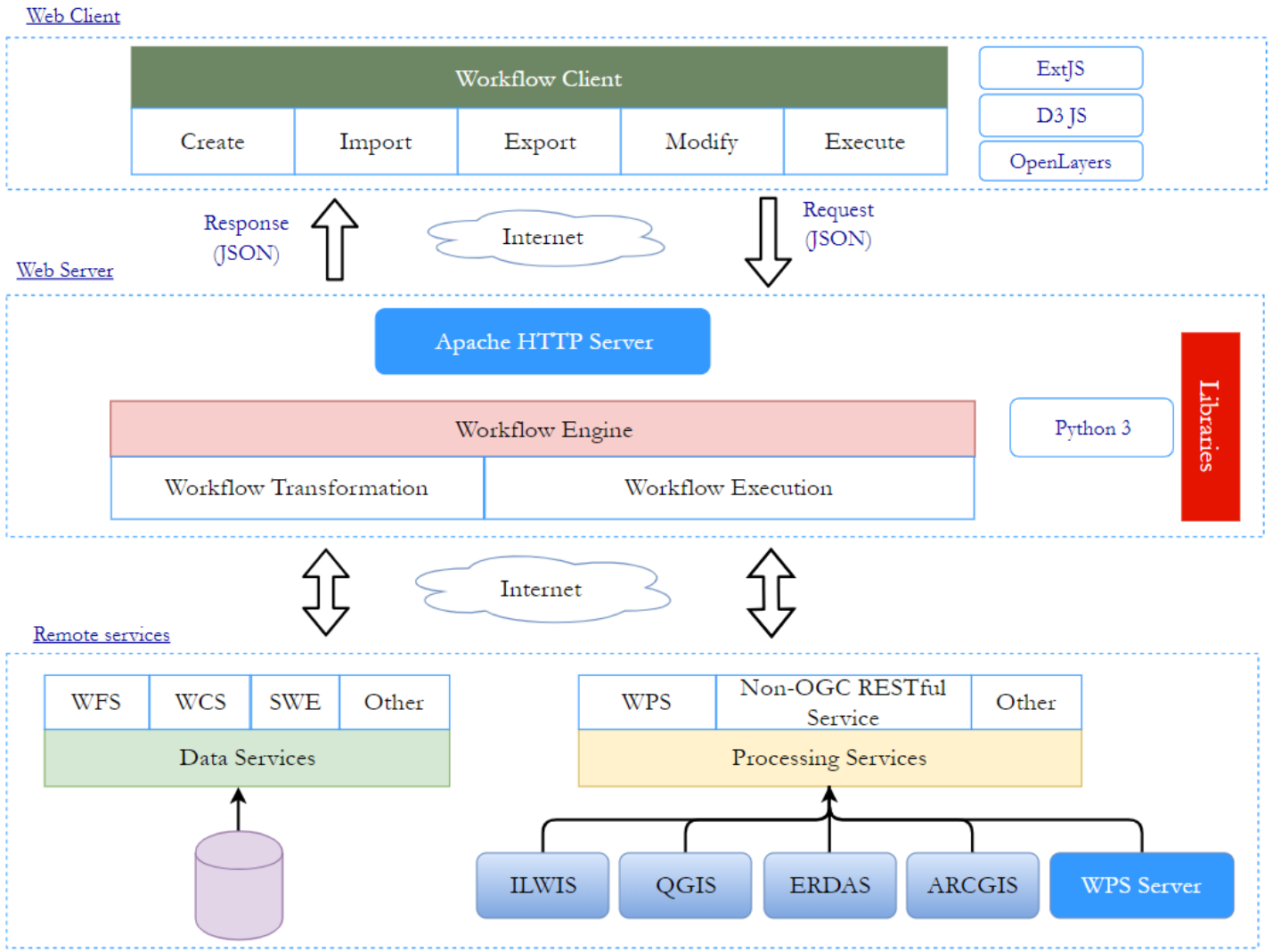
OGC Services implementations

Workflow engine

Service chaining

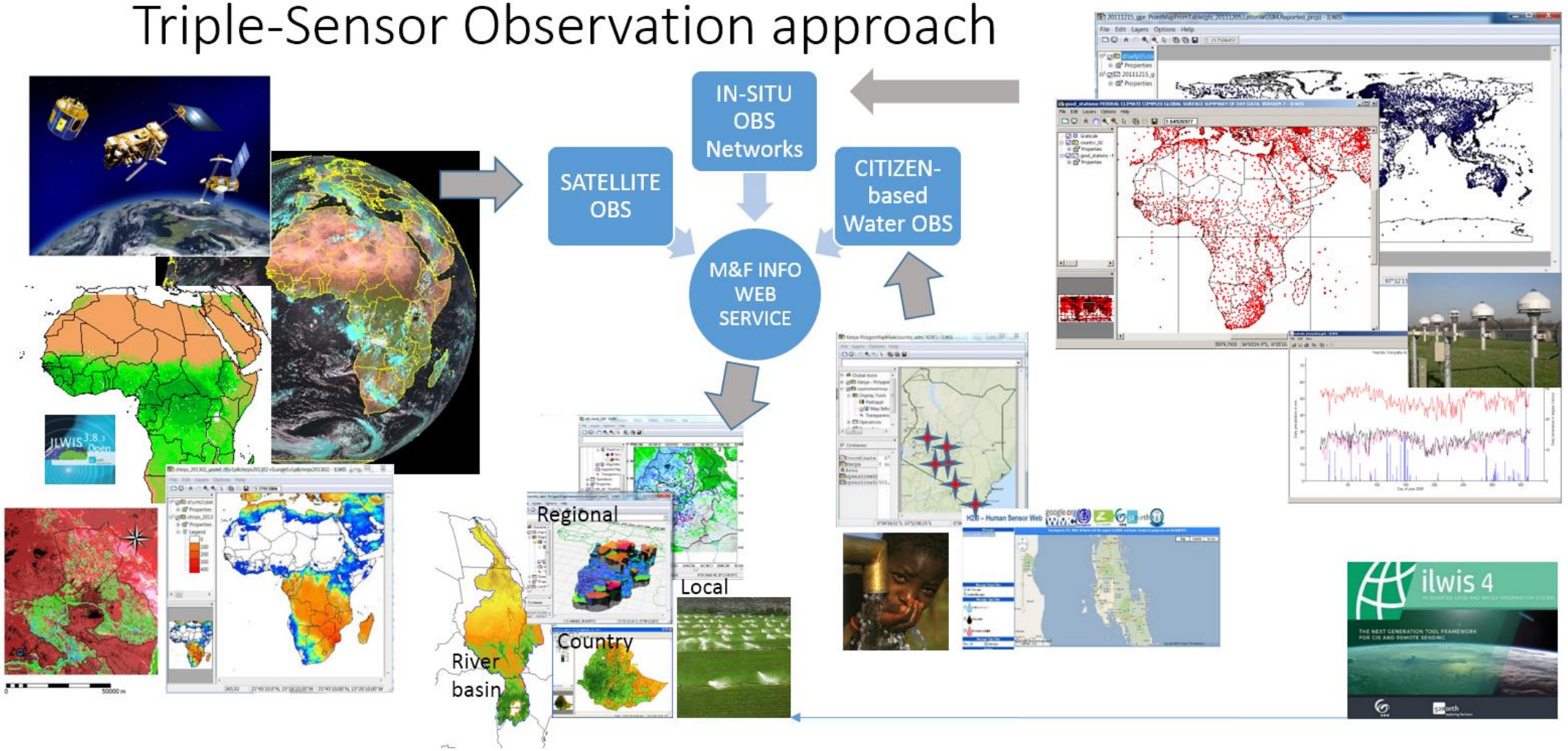
Workflow execution

Workflow Transformation

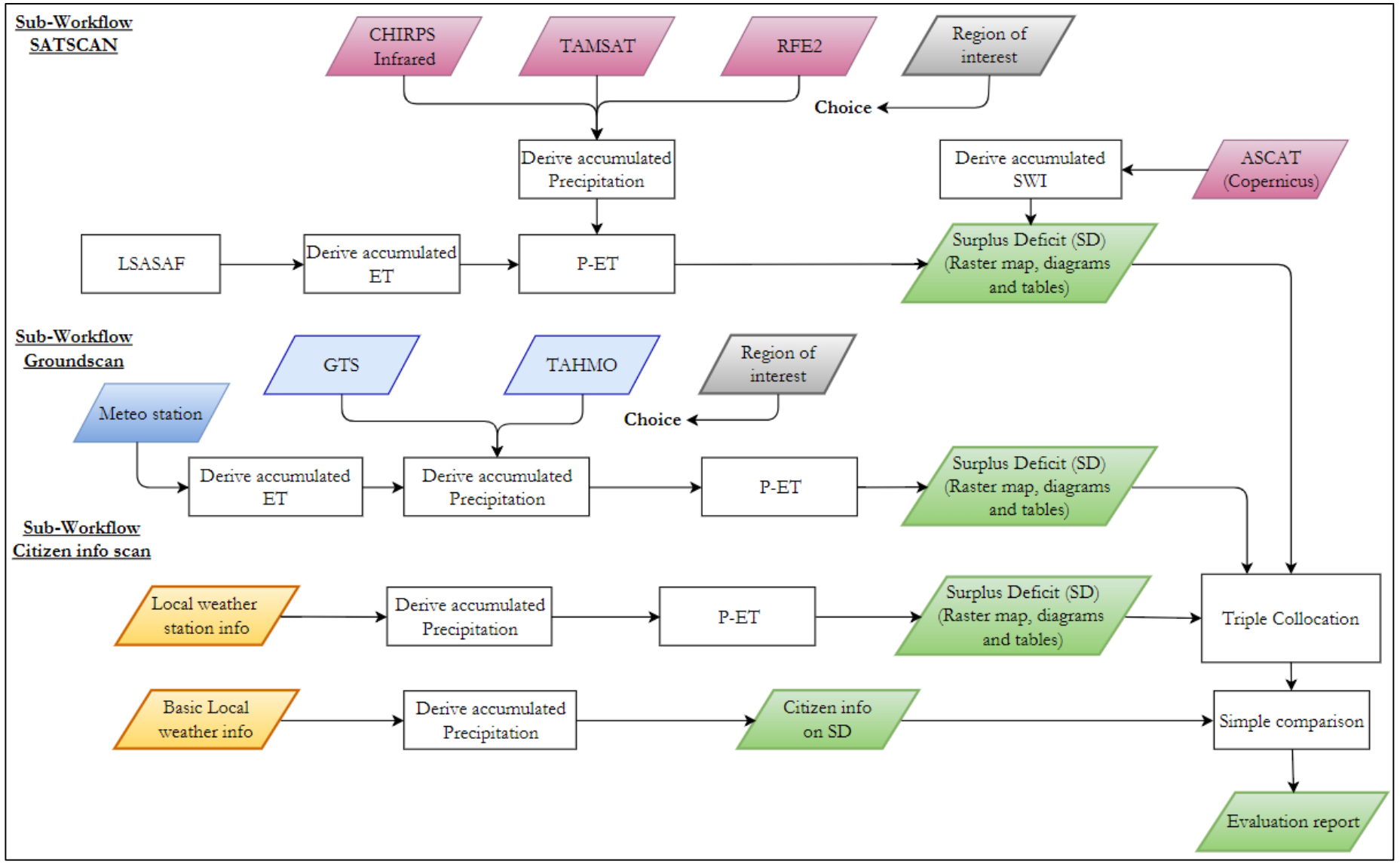


AfriAlliance project

Water Resources Monitoring & Forecasting using a Triple-Sensor Observation approach



Triple sensor approach sample workflow



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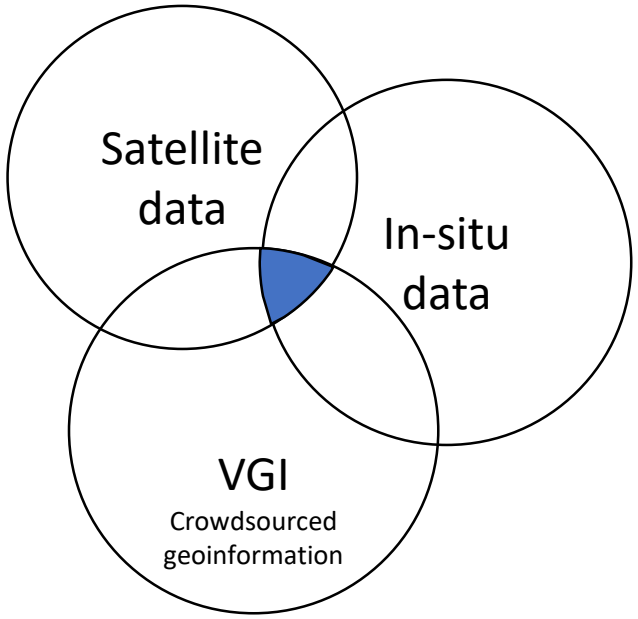
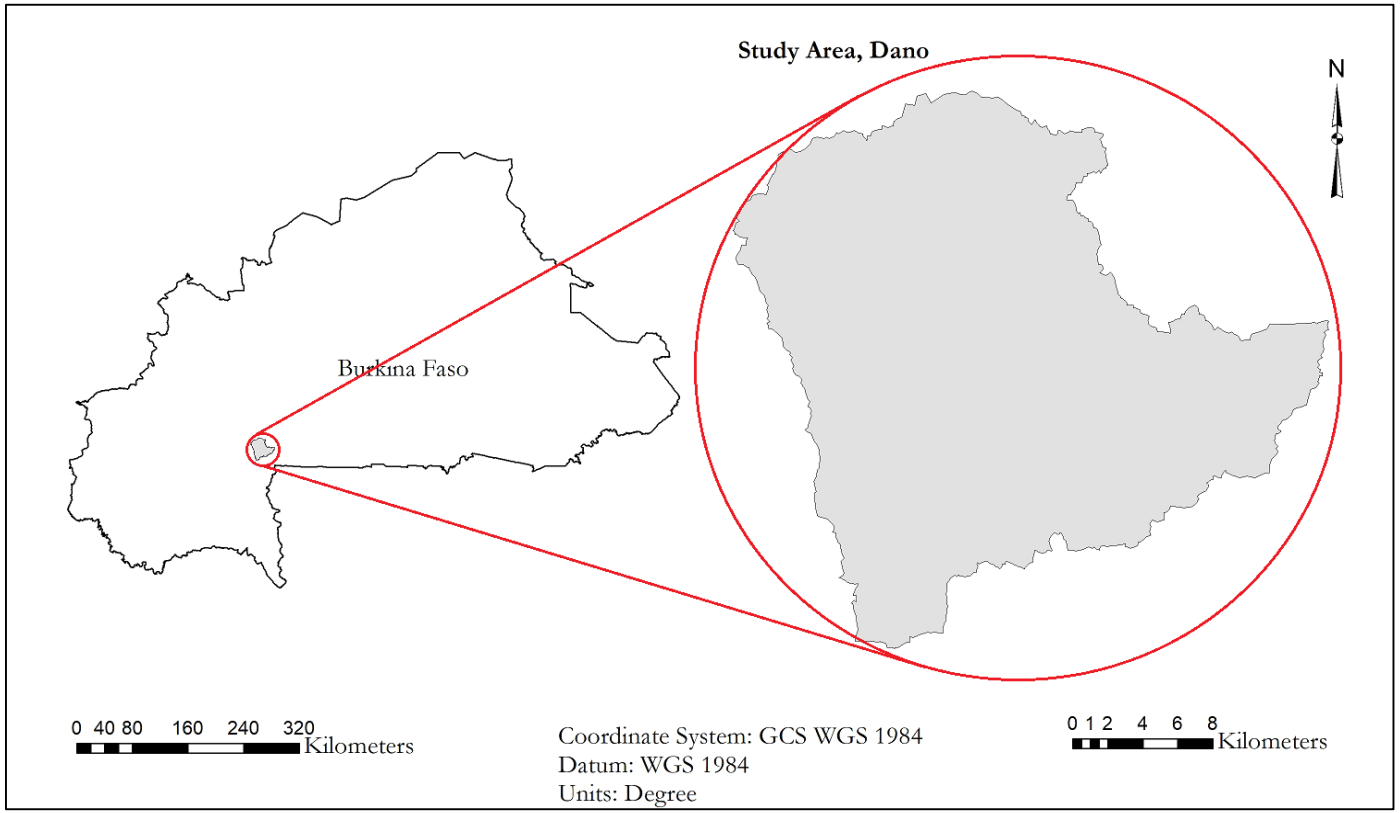
Case study





Data Sources:

- Chirps rainfall (WCS)
- NOAA Climate Prediction Centre (SOS)
- Water Point Data Exchange database (SOS)

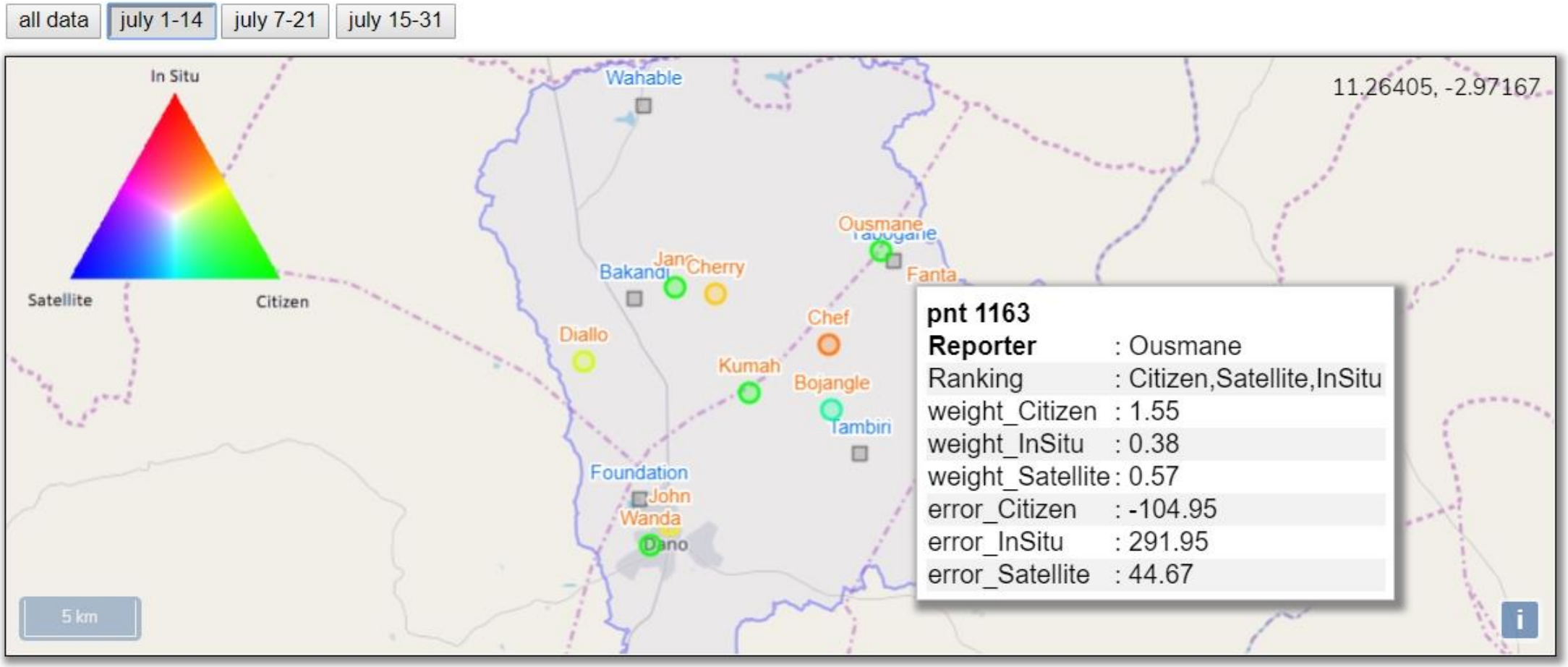
Result of triple sensor collocation

Location	W1		W2		W3		Best performance
	A	B	A	B	A	B	
pnt_608	0.816	0.814	0.843	0.839	1.063	1.065	W3
pnt_610	0.770	0.768	0.882	0.876	0.997	1.000	W3
pnt_611	0.644	0.640	1.056	1.050	0.870	0.876	W2
pnt_619	0.700	0.705	1.014	1.021	0.888	0.882	W2
pnt_620	0.601	0.598	1.093	1.090	0.869	0.873	W2
pnt_648	0.589	0.592	1.213	1.215	0.729	0.725	W2
pnt_1019	0.580	0.577	1.137	1.134	0.787	0.790	W2
pnt_1100	0.823	0.823	0.881	0.887	1.004	1.004	W3
pnt_1101	0.984	0.982	0.735	0.744	0.911	0.912	W1
pnt_1163	0.910	0.910	0.764	0.769	1.062	1.062	W3
pnt_1227	0.953	0.953	0.695	0.687	0.969	0.969	W3
RMSE	0.009		0.019		0.011		

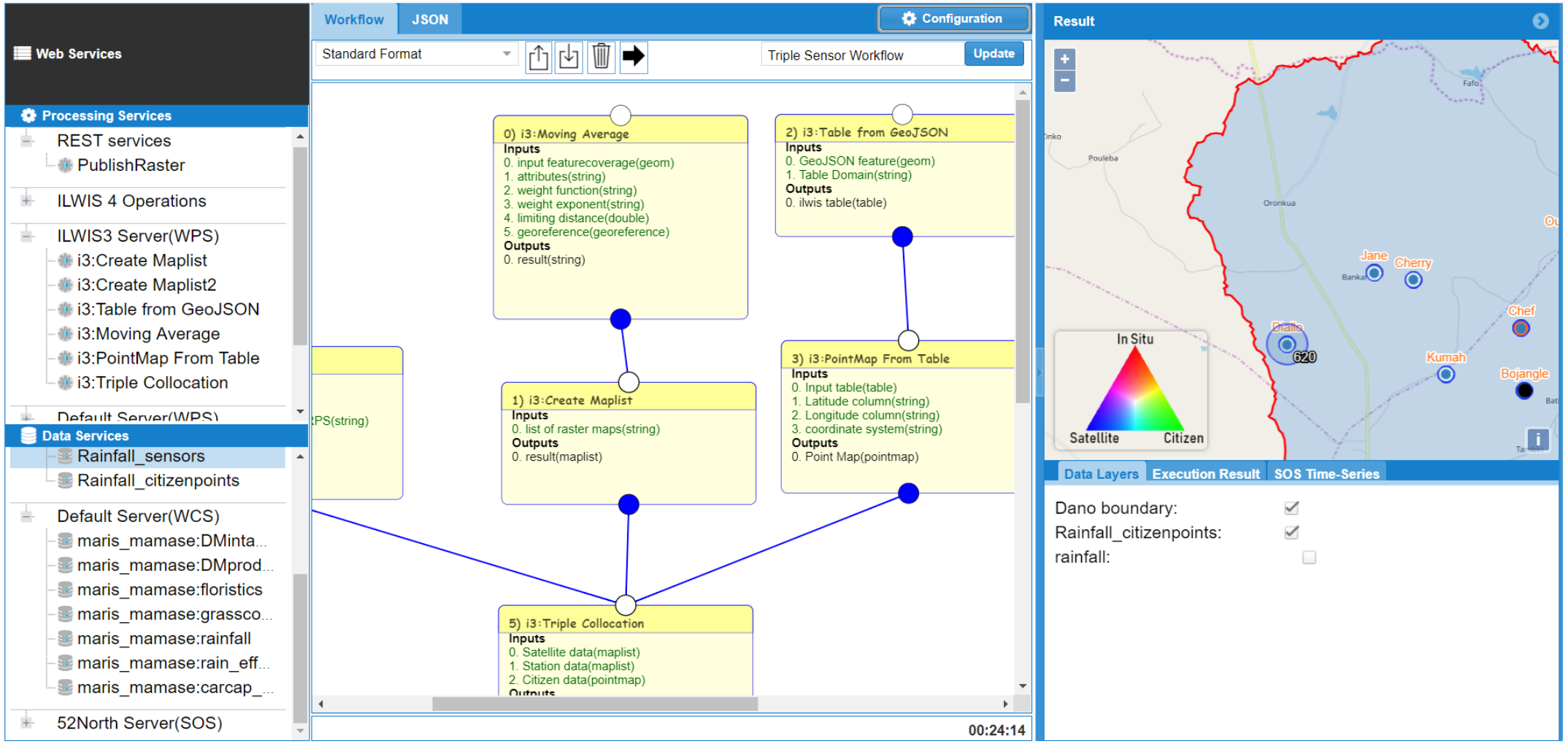
W1 ~ Satellite sensor**, W2 ~** In-situ sensor**, W3 ~** Citizen Sensor

A ~ Our method **B ~** Mannaerts et al. (2018),

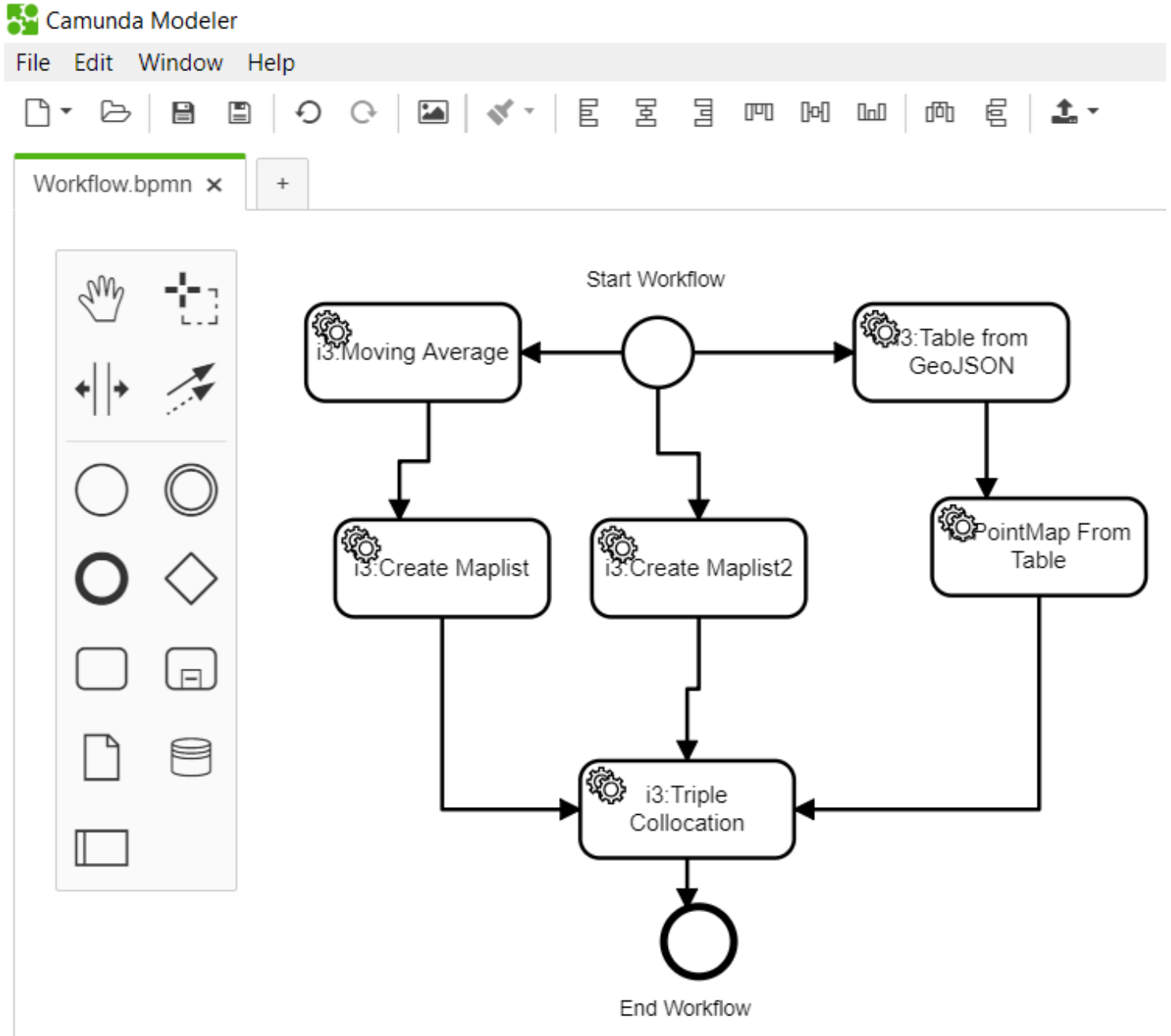
Result of triple sensor collocation



Workflow software as Web application



Sharing the workflow with CAMUNDA WFMS



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Further reading and contact

Kechagioglou, X., & Lemmens, R. (2018). Sharing geoprocessing workflows with Business Process Model and Notation (BPMN). Research Paper, 2–7.

Ubels, S. (2018). Understanding abstract geo-information workflows and converting them to executable workflows using Semantic Web technologies. MSc Thesis University of Twente, Faculty of Geoinformation Science and Earth Observation.

Ohuru, R. (2019) A Method for Enhancing Shareability and Reproducibility of Geoprocessing Workflows. Case Study: Integration of Crowdsourced Geoinformation, Satellite and In-Situ Data for Water Resource Monitoring. MSc Thesis University of Twente, Faculty of Geoinformation Science and Earth Observation.

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