AQUATAP-ES TAP Workshop 3

Part 2

"Developing Approaches for Assessing and Optimising the Value of Ecosystem Services"

Michael Bruen

Virtual meeting

8th October 2020

Catalogue of Ecosystem Services Models

José María Bodoque del Pozo & Michael Bruen

Structure: Word Document with two parts

(i) Catalogue as Table

- Rows → Individual ecosystem services
- Columns → Model attributes

(ii) List of References and links to manuals and other technical information

Note: needs broad interpretation → models that support ecosystem services studies

Model attributes of interest

1) Ecosystem Service
2) Category (Provisioning, Regulation, Cultural)
3) Example
4) Model(s)
5) Modeling approach
6) Typical Spatial scales
7) Typical Temporal scales
8) Actively Maintained by
9) User-base / support group
10) Key reference(s)/Report(s)/Links
11) Observations (open source etc.)

Ecosystem Services	Category	Example	Model(s)	Modeling approach	Typical Spatial scales	Typical Temporal scales	Actively Maintained by	User-base / support group	Key reference(s)/Report(s)/Links	Observations
Surface water	Provisioning (abiotic)	Surface water for drinking and non-drinking purposes	SWAT	Physically-based model	Small watershed to river basin-scale	Daily and monthly	United States Department of Agriculture (USDA)	SWAT User Group ArcSWAT Group SWAT-CUP Group QSWAT Group SWAT-MODFLOW Group	Abbaspour et al. (2007) Arnold et al. (2012)	Free
			MIKE SHE	Physically-based model	Single soil profile to river basin-scale	Sub-hourly and hourly	Danish Hydraulic Institute (DHI)	Mike User Forum	Graham and Butts (2005)	Commercial
			HBV Hydrology Model	Semidistributed conceptual catchment model	Small watershed to river basin-scale	Daily and monthly	Swedish Meteorological and Hydrological Institute	None	Bergström (1992)	Free
			TOPMODEL	Physically-based distributed model	Landscape to watershed scale	Hourly, daily and monthly	Keith Beven (Lancaster Univesrity)	None	Beven (1997)	Free
Ground (and subrsuface) water	Provisioning (abiotic)	Groundwater for drinking and non-drinking purposes	MODFLOW	Physically-based model	Local-scale to regional-scale groundwater models	Hourly	United States Geological Survey (USGS)	MODFLOW Users Group	Harbaugh (2005)	Free
			FEFLOW	Physically-based model	Local-scale to regional-scale groundwater models	Hourly	Danish Hydraulic Institute (DHI)	FEFLOW Users Group	Diers (2013)	Commercial
Freshwater surface water used as an energy source.	Provisioning (abiotic)	Hydroelectric power	HEC-Ras	Physically-based model	Reach scale (100 m – 100 km)	Minutes - hours	USACE	USACE	USACE (2016)	Free
			MIKE 11	Physically-based model	Reach scale (100 m – 100 km)	Minutes - hours	Danish Hydraulic Institute (DHI)	Mike User Forum	DHI (2017)	Commercial
			HEC-ResSim	Conceptual model	Small watershed to river basin-scale	Daily	USACE	USACE	USACE (2013)	Free
			MIKE HYDRO BASIN	Conceptual model	Small watershed to river basin-scale	Daily	Danish Hydraulic Institute (DHI)	Mike User Forum	DHI (2014)	Commercial
			MaxHydro	Conceptual model	Reservoir	Subhourly to monthly	Hydropower Optimization Software			Commercial
			Optipower	Conceptual model	Reservoir	Daily	Power Vision Engineering			Commercial

Ecosystem Services	Category	Example	Model(s)	Modeling approach	Typical Spatial scales	Typical Temporal scales	Actively Maintained by	User-base / support group	Key reference(s)/Report(s)/Links	Observations
Control of erosion rates	Regulation (abiotic/biotic)	Sheet erosion	RUSLE/MUSLE	empirical	Field scale	Annual or storm event	USA ARS	none	USA ARS	Free to use, but database USA focussed
		River channel erosion and deposition	HECRAS	Physically-based and empirical	River reach, network	Minutes to years	USACE	none	https://www.hec.usace.army.mil/software/hec-ras/	Free to use
		Landscape evolution	WaTEM/SEDEM	empirical	Field scale	Annual or storm event	K.U. Leuven (exists but not active?)	none	Haeregeweyn et al (2013) https://ees.kuleuven.be/geography/modelling/watemsedem/index.html	Free to use
		Landscape evolution	CAESAR-Lisflood	empirical	Landsacape scale	Years to centuries	University of Liverpool	Inactive blog	https://sourceforge.net/projects/caesar-lisflood/	Free to use
Regulation of temperature and humidity	Regulation (biotic)		SNTEMP				USGS	none	Voss et al (2008)	Free to use
Air quality regulation	Regulation (biotic)									
Maintaining nursery populations and habitats	Regulation (biotic)									
Water purification	Regulation (biotic)	Sedimentation Biotic uptake Microbial decomposition								
Soil formation and composition	Regulation (biotic)	Weathering transport								

Input needed

Ecosystem Services	Category	Example	Model(s)	Modeling approach	Typical Spatial scales	Typical Temporal scales	Actively Maintained by	User-base / support group	Key reference(s)/Report(s)/Links	Observations
Recreation	Cultural									
Intellectual and aesthetic appreciation	Cultural									
Spiritual and symbolic appreciation	Cultural									

Considerations

1. There are thousands of models described in the literature – we are mainly interested in models that have been used in more than one application or by more than one group

2. Preferably, the model should be actively supported and/or have an active user group

3. The model should have an appropriate modelling approach (although this may be subjective)

4. Models associated with cultural services especially welcome

Next Steps

0. First draft of catalogue has been circulated by Lisa

1. Suggest more rows (Services) to be added (with or without model suggestions)

2. Once these additional services are added then

3. Circulate widely for more model suggestions/information

4. Finalise catalogue, analyse & distribute …