TARGET: DEVELOP CURVE NUMBER GRIDS OVER INDIA

DATASETS

LULC from ISRO's NRSC (56 m)

Soil Data from ISRIC's SoilGrids (250 m)

METHODOLOGY:

Step 1: Reclassify LULC classes to the five major classes depending upon the following table obtained from literature.

LULC Categories	Class	Recategories	Reclass
Build up	1	Buildup	1
Kharif	2	Agri	2
Rabi	3	Agri	2
Zaid	4	Agri	2
Double/triple	5	Agri	2
Current fallow	6	Agri	2
Plantation/orchad	7	Agri	2
Evergreen forest	8	Forest	3
Decidious forest	9	Forest	3
Scrub/deg forest	10	Forest	3
Littoral swamp	11	Forest	3
Grassland	12	Forest	3
Shifting cultivation	13	Agri	2
Wasteland	14	WasteLand	4
Rann	15	WasteLand	4
Water bodies max	16	Water	5
Water bodies min	17	Water	5
Snow Cover	18	Snow	6

Step 2: Reclassify the soil texture classes into Hydrological Soil Groups (HSG) using following table (USDA, 2009):

Texture Class	Runoff Potential	HSG Group
Sand	Low	A
Sandy loam	Moderately Low	B
Loamy sand	Moderately Low	B
Loam	Moderately High	C
Silt loam	Moderately High	C
Sandy Clay Loam	Moderately High	C

Clay Loam	Moderately High	C
Sandy Clay	High	D
Silty Clay loam	Moderately High	C
Clay	High	D
Silty Clay	High	D
Silt	Moderately High	C

Step 3: Assign Curve Numbers (CN) to each pixel corresponding to the lookup table showing below (Ranjan et al., 2018)

S. No.	LULC Class	LULC Code	Hydrological soil group			
			A	B	C	D
1	Built-up	1	63	75	88	90
2	Agricultural	2	50	69	78	85
3	Evergreen Broadleaf Forest	3	34	60	73	79
4	Shrubland/Wasteland	4	48	68	75	80
5	Water Bodies	5	97	98	99	100
6	Snow and Ice/Glacier	6	67	77	82	84

Step 4: The CN Grid assigned corresponding to the above table is considered as average CN or class II (CN$_{II}$). To estimate CN$_I$ and CN$_{II}$ i.e., Curve Numbers corresponding to AMC$_I$ and AMC$_{III}$

CN is a dimensionless run-off coefficient that depends on land use, soil and antecedent moisture condition (AMC). Antecedent moisture is the relative dryness or wetness of a catchment which changes continuously and has a significant effect on the run-off process28. AMC can be divided into three classes.

AMC$_I$ is considered for the dry condition with five-day antecedent rainfall, i.e. AMC is less than 13 mm. When AMC is more than 28 mm, it may be a wet condition (AMC$_{III}$) and when 13 mm $\leq$ AMC < 28 mm, it can be considered as average (AMC$_{II}$)29. For AMC$_{II}$ CNs have been proposed based on a combination of LULC and soil group conditions. For AMC$_I$ and AMC$_{III}$, CN can be derived by the following equations (Amutha et al 2009, Mishra et al 2006):

$$CN_I = \frac{CN_{II}}{2.281 - 0.0128 * CN_{II}}$$

$$CN_{III} = \frac{CN_{II}}{0.427 - 0.00573 * CN_{II}}$$