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Losses from Precipitation Formulas

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List of 25 Losses from Precipitation Formulas

Losses from Precipitation

Determination of Evapotranspiration

1) Consumptive Use of Water for Large Areas

$$fx \quad C_u = I + P_{mm} + (G_s - G_e) - V_o$$

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)

$$ex \quad 45.035m^3/s = 20m^3/s + 35mm + (80m^3 - 30m^3) - 25m^3$$

2) Equation for Constant depending upon Latitude in Net Radiation of Evaporable Water Equation

$$fx \quad a = 0.29 \cdot \cos(\Phi)$$

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

$$ex \quad 0.145 = 0.29 \cdot \cos(60^\circ)$$

3) Equation for Parameter Including Wind Velocity and Saturation Deficit

$$fx \quad E_a = 0.35 \cdot \left(1 + \left(\frac{W_v}{160} \right) \right) \cdot (e_s - e_a)$$

[Open Calculator !\[\]\(f1c5da15572e3e09d343161be98f508d_img.jpg\)](#)

$$ex \quad 5.089636 = 0.35 \cdot \left(1 + \left(\frac{2cm/s}{160} \right) \right) \cdot (17.54mmHg - 3mmHg)$$

4) Transpiration ratio

$$fx \quad T = \frac{W_w}{W_m}$$

[Open Calculator !\[\]\(166772600a13ad0a433053f90fe45649_img.jpg\)](#)

$$ex \quad 2.5 = \frac{5kg}{2.0kg}$$

5) Water Consumed by Transpiration

$$fx \quad W_t = (W_1 + W) - W_2$$

[Open Calculator !\[\]\(a8ff699ced33317c53c86f9bf3171905_img.jpg\)](#)

$$ex \quad 6kg = (8kg + 2kg) - 4kg$$



Evaporation

6) Dalton's Law of Evaporation

$$\text{fx } E = K_o \cdot (e_s - e_a)$$

[Open Calculator !\[\]\(a03a7eb2f4046e1d3c76772003e549ea_img.jpg\)](#)

$$\text{ex } 2907.753 = 1.5 \cdot (17.54\text{mmHg} - 3\text{mmHg})$$

7) Dalton-Type Equation

$$\text{fx } E_{\text{lake}} = K \cdot f_u \cdot (e_s - e_a)$$

[Open Calculator !\[\]\(5361750c22c4e047a52f4eac1ec2d4cc_img.jpg\)](#)

$$\text{ex } 12.359 = 0.5 \cdot 1.7 \cdot (17.54\text{mmHg} - 3\text{mmHg})$$

8) Meyers formula (1915)

$$\text{fx } E_{\text{lake}} = K_m \cdot (e_s - e_a) \cdot \left(1 + \frac{u_g}{16}\right)$$

[Open Calculator !\[\]\(b792654f2cef9719eabeb6c5be00811e_img.jpg\)](#)

$$\text{ex } 12.39898 = 0.36 \cdot (17.54\text{mmHg} - 3\text{mmHg}) \cdot \left(1 + \frac{21.9\text{km/h}}{16}\right)$$

9) Rohwers formula (1931)

$$\text{fx } E_{\text{lake}} = 0.771 \cdot (1.465 - 0.00073 \cdot P_a) \cdot (0.44 + 0.0733 \cdot u_0) \cdot (e_s - e_a)$$

[Open Calculator !\[\]\(84f47badaad7772cd95667a7c387a639_img.jpg\)](#)

$$\text{ex } 12.37788 = 0.771 \cdot (1.465 - 0.00073 \cdot 4\text{mmHg}) \cdot (0.44 + 0.0733 \cdot 4.3\text{km/h}) \cdot (17.54\text{mmHg} - 3\text{mmHg})$$

10) Vapour Pressure of Air using Dalton's Law

$$\text{fx } e_a = e_s - \left(\frac{E}{K_o}\right)$$

[Open Calculator !\[\]\(c15650232aa6660c9deb34f3b82dcb72_img.jpg\)](#)

$$\text{ex } 3.003764\text{mmHg} = 17.54\text{mmHg} - \left(\frac{2907}{1.5}\right)$$

11) Vapour Pressure of Water at given Temperature for Evaporation in Water Bodies

$$\text{fx } e_s = \left(\frac{E}{K_o}\right) + e_a$$

[Open Calculator !\[\]\(06b7456efb47d301bca6298603e7f4fc_img.jpg\)](#)

$$\text{ex } 17.53624\text{mmHg} = \left(\frac{2907}{1.5}\right) + 3\text{mmHg}$$



Interception

12) Duration of Rainfall given Interception Loss

$$fx \quad t = \frac{I_i - S_i}{K_i \cdot E_r}$$

[Open Calculator !\[\]\(23d9fc146e83b5c3013cfa32c784f8d5_img.jpg\)](#)

$$ex \quad 1.5h = \frac{8.7mm - 1.2mm}{2 \cdot 2.5mm/h}$$

13) Evaporation Rate given Interception Loss

$$fx \quad E_r = \frac{I_i - S_i}{K_i \cdot t}$$

[Open Calculator !\[\]\(aa53ad6fea213b8b2226d3077e30533a_img.jpg\)](#)

$$ex \quad 2.5mm/h = \frac{8.7mm - 1.2mm}{2 \cdot 1.5h}$$

14) Interception Loss

$$fx \quad I_i = S_i + (K_i \cdot E_r \cdot t)$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a_img.jpg\)](#)

$$ex \quad 1.200002mm = 1.2mm + (2 \cdot 2.5mm/h \cdot 1.5h)$$

15) Interception Storage given Interception Loss

$$fx \quad S_i = I_i - (K_i \cdot E_r \cdot t)$$

[Open Calculator !\[\]\(c1168d6a8b365d11e842ece304635fa7_img.jpg\)](#)

$$ex \quad 1.2mm = 8.7mm - (2 \cdot 2.5mm/h \cdot 1.5h)$$

16) Ratio of Vegetal Surface Area to its Projected Area given Interception Loss


$$fx \quad K_i = \frac{I_i - S_i}{E_r \cdot t}$$

[Open Calculator !\[\]\(ccd39a0dc6d5afcc151e1371f9462f58_img.jpg\)](#)

$$ex \quad 2 = \frac{8.7mm - 1.2mm}{2.5mm/h \cdot 1.5h}$$

Measurement of Evaporation




Budget Method 17) Bowen's Ratio 

$$\text{fx } \beta = \frac{H_a}{\rho_{\text{water}} \cdot L \cdot E_L}$$

Open Calculator 


$$\text{ex } 0.05102 = \frac{20\text{J}}{1000\text{kg/m}^3 \cdot 7\text{J/kg} \cdot 56\text{mm}}$$

18) Energy Balance to Evaporating Surface for Period of One Day 

$$\text{fx } H_n = H_a + H_e + H_g + H_s + H_i$$

Open Calculator 

$$\text{ex } 388.21\text{W/m}^2 = 20\text{J} + 336\text{W/m}^2 + 0.21\text{W/m}^2 + 22.0\text{W/m}^2 + 10\text{W/m}^2$$

19) Evaporation from Energy Budget Method 

$$\text{fx } E_L = \frac{H_n - H_g - H_s - H_i}{\rho_{\text{water}} \cdot L \cdot (1 + \beta)}$$

Open Calculator 


$$\text{ex } 48.26889\text{mm} = \frac{388\text{W/m}^2 - 0.21\text{W/m}^2 - 22.0\text{W/m}^2 - 10\text{W/m}^2}{1000\text{kg/m}^3 \cdot 7\text{J/kg} \cdot (1 + 0.053)}$$

20) Heat Energy used up in Evaporation 

$$\text{fx } H_e = \rho_{\text{water}} \cdot L \cdot E_L$$

Open Calculator 

$$\text{ex } 392\text{W/m}^2 = 1000\text{kg/m}^3 \cdot 7\text{J/kg} \cdot 56\text{mm}$$


Reservoir Evaporation and Methods of Reduction 21) Average Reservoir Area during Month given Volume of Water Lost in Evaporation 

$$\text{fx } A_R = \frac{V_E}{E_{\text{pm}} \cdot C_p}$$

Open Calculator 

$$\text{ex } 10\text{m}^2 = \frac{56\text{m}^3}{16\text{m} \cdot 0.35}$$




22) Pan Evaporation Loss 

$$\text{fx } E_{\text{pm}} = E_{\text{lake}} \cdot n \cdot 10^{-3}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)


$$\text{ex } 0.369\text{m} = 12.3 \cdot 30 \cdot 10^{-3}$$

23) Pan Evaporation Loss given Volume of Water Lost in Evaporation in Month 

$$\text{fx } E_{\text{pm}} = \frac{V_E}{A_R \cdot C_p}$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

$$\text{ex } 16\text{m} = \frac{56\text{m}^3}{10\text{m}^2 \cdot 0.35}$$

24) Relevant Pan Coefficient given Volume of Water Lost in Evaporation in Month 

$$\text{fx } C_p = \frac{V_E}{A_R \cdot E_{\text{pm}}}$$

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60_img.jpg\)](#)

$$\text{ex } 0.35 = \frac{56\text{m}^3}{10\text{m}^2 \cdot 16\text{m}}$$

25) Volume of Water Lost in Evaporation in Month 

$$\text{fx } V_E = A_R \cdot E_{\text{pm}} \cdot C_p$$

[Open Calculator !\[\]\(5abce1a84a655b073239ab33e1199487_img.jpg\)](#)

$$\text{ex } 56\text{m}^3 = 10\text{m}^2 \cdot 16\text{m} \cdot 0.35$$



Variables Used














- **a** Constant depending on Latitude
- **A_R** Average Reservoir Area (Square Meter)
- **C_p** Relevant Pan Coefficient
- **Cu** Consumptive Use of Water for Large Areas (Cubic Meter per Second)
- **E** Evaporation from Water Body
- **e_a** Actual Vapour Pressure (Millimeter Mercury (0 °C))
- **E_a** Actual Mean Vapor Pressure
- **E_L** Daily Lake Evaporation (Millimeter)
- **E_{lake}** Lake Evaporation
- **E_{pm}** Pan Evaporation Loss (Meter)
- **E_r** Evaporation Rate (Millimeter per Hour)
- **e_s** Saturation Vapour Pressure (Millimeter Mercury (0 °C))
- **f_u** Wind Speed Correction Factor
- **G_e** Ground Water Storage at the End (Cubic Meter)
- **G_s** Ground Water Storage (Cubic Meter)
- **H_a** Sensible Heat Transfer from Water Body (Joule)
- **H_e** Heat Energy used up in Evaporation (Watt per Square Meter)
- **H_g** Heat Flux into the Ground (Watt per Square Meter)
- **H_i** Net Heat Conducted out system by Water Flow (Watt per Square Meter)
- **H_n** Net Heat Received by Water Surface (Watt per Square Meter)
- **H_s** Head Stored in Water Body (Watt per Square Meter)
- **I** Inflow (Cubic Meter per Second)
- **I_i** Interception Loss (Millimeter)
- **K** Coefficient
- **K_i** Ratio of Vegetal Surface Area to Projected Area
- **K_m** Coefficient Accounting for Other Factors
- **K_o** Proportionality Constant
- **L** Latent Heat of Evaporation (Joule per Kilogram)
- **n** Number of Days in a Month
- **P_a** Atmospheric Pressure (Millimeter Mercury (0 °C))
- **P_{mm}** Precipitation (Millimeter)



- S_i Interception Storage (Millimeter)
- t Duration of the Rainfall (Hour)
- T Transpiration Ratio
- u_0 Mean Wind Velocity at Ground Level (Kilometer per Hour)
- u_g Monthly Mean Wind Velocity (Kilometer per Hour)
- V_E Volume of Water Lost in Evaporation (Cubic Meter)
- V_O Mass Outflow (Cubic Meter)
- W Amount of Water applied during Growth (Kilogram)
- W_1 Entire Plant Set Up Weighed in the Beginning (Kilogram)
- W_2 Entire Plant Set Up Weighed at the End (Kilogram)
- W_m Weight of Dry Mass produced (Kilogram)
- W_t Water Consumed by Transpiration (Kilogram)
- W_v Mean Wind Velocity (Centimeter per Second)
- W_w Weight of Water Transpired (Kilogram)
- β Bowen's Ratio
- ρ_{water} Water Density (Kilogram per Cubic Meter)
- Φ Latitude (Degree)



Constants, Functions, Measurements used

- **Function:** **cos**, $\cos(\text{Angle})$
Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- **Measurement:** **Length** in Millimeter (mm), Meter (m)
Length Unit Conversion 
- **Measurement:** **Weight** in Kilogram (kg)
Weight Unit Conversion 
- **Measurement:** **Time** in Hour (h)
Time Unit Conversion 
- **Measurement:** **Volume** in Cubic Meter (m^3)
Volume Unit Conversion 
- **Measurement:** **Area** in Square Meter (m^2)
Area Unit Conversion 
- **Measurement:** **Pressure** in Millimeter Mercury (0 °C) (mmHg)
Pressure Unit Conversion 
- **Measurement:** **Speed** in Centimeter per Second (cm/s), Kilometer per Hour (km/h), Millimeter per Hour (mm/h)
Speed Unit Conversion 
- **Measurement:** **Energy** in Joule (J)
Energy Unit Conversion 
- **Measurement:** **Angle** in Degree ($^\circ$)
Angle Unit Conversion 
- **Measurement:** **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
Volumetric Flow Rate Unit Conversion 
- **Measurement:** **Heat Flux Density** in Watt per Square Meter (W/m^2)
Heat Flux Density Unit Conversion 
- **Measurement:** **Density** in Kilogram per Cubic Meter (kg/m^3)
Density Unit Conversion 
- **Measurement:** **Latent Heat** in Joule per Kilogram (J/kg)
Latent Heat Unit Conversion 



Check other formula lists

- [Abstractions from Precipitation Formulas](#) 
- [Area-Velocity and Ultrasonic Method of Streamflow Measurement Formulas](#) 
- [Discharge Measurements Formulas](#) 
- [Indirect Methods of Streamflow Measurement Formulas](#) 
- [Losses from Precipitation Formulas](#) 
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