

Rainwater Harvesting in the Caribbean

RWH Technical Fact Sheet 1A: Calculating the amount of water you can capture off your roof

Using the *Rational Method* to calculate the volume of rainwater which could be captured

For the amount of water you can capture in one year you will need to estimate the area of your roof, the average annual rainfall at your location and the runoff coefficient for the surface. The mathematical relationship is given as:

Supply (litres per year) = rainfall (mm/year) x area (m²) x runoff coefficient
(multiply by answer by 0.22 to convert the value to imperial gallons per year)

Note that if your roof is angled you will need to 'project' the surface to the horizontal to correctly estimate the amount of rain that falls on the roof. For a sloped roof you will need to know the roof angle (see **overleaf**). The roof area is calculated by the following relationship:

Roof surface area (m²) = roof length (m) x roof width (m) x sine of the angle (in degrees)

The runoff coefficients for various surfaces are given below.

A worked example:

- Mean annual rainfall = 1,500 mm per year
- Roof area = 10 m (length) x 8 m (width) x sine (of 70 degree slope) = 75 m²
- Roof surface is smooth corrugated metal. This surface is assumed to have a runoff coefficient of 0.8

Supply = 1,500 x 75 x 0.8 = 90,000 litres (19,800 gallons) per year

Type of roof surface	Runoff coefficients*
Tiles	0.8 - 0.9
Corrugated metal sheets	0.7 - 0.9
Concrete	0.6 - 0.8

*Source: Alphonsus Daniel, pers. comm. 2008

Collaborative production between the Caribbean Environmental Health Institute and the United Nations Environment Programme



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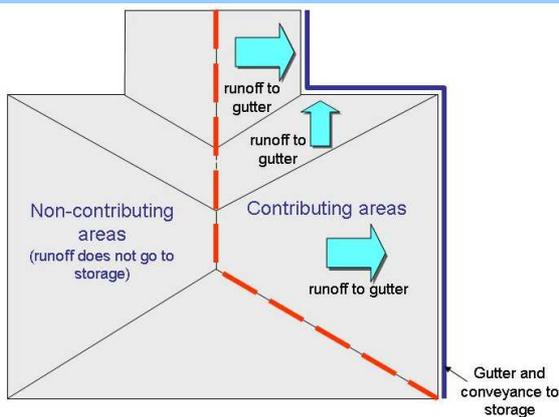


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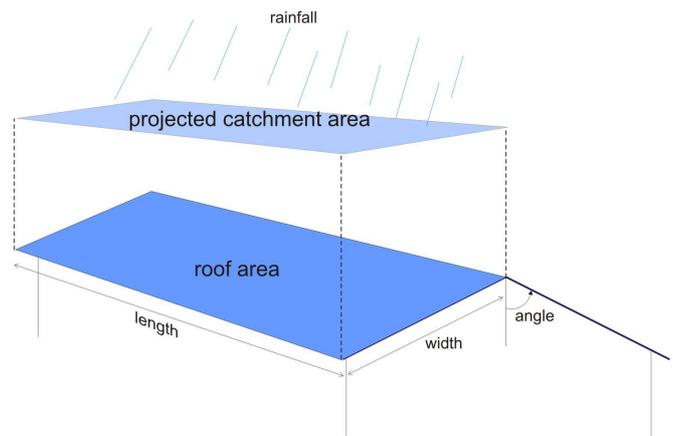
RWH Technical Fact Sheet 1B: Calculating the amount of water you can capture off your roof

Calculating the catchment area for sloped roof surfaces

Mapping your roof areas – determining the contributing catchments

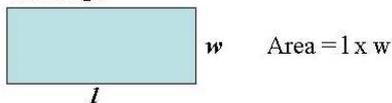


Projecting the sloped roof area to horizontal catchment area

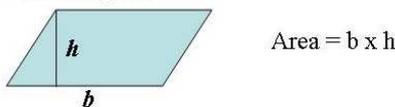


The following are formulas to estimate the areas of roof section shapes

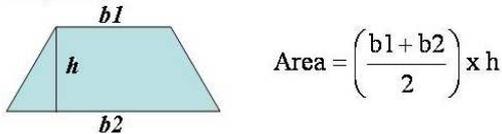
Rectangle



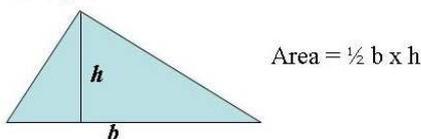
Parallelogram



Trapezoid



Triangle



Projecting the sloped roof area to horizontal catchment area – Sine of the roof angle; multiply by roof dimensions

Sine of roof angles from 1 to 90 degrees

Angle (degrees)	Sine (angle)								
1	0.0175	21	0.3584	41	0.6561	61	0.8746	81	0.9877
2	0.0349	22	0.3746	42	0.6691	62	0.8829	82	0.9903
3	0.0523	23	0.3907	43	0.6820	63	0.8910	83	0.9925
4	0.0698	24	0.4067	44	0.6947	64	0.8988	84	0.9945
5	0.0872	25	0.4226	45	0.7071	65	0.9063	85	0.9962
6	0.1045	26	0.4384	46	0.7193	66	0.9135	86	0.9976
7	0.1219	27	0.4540	47	0.7314	67	0.9205	87	0.9986
8	0.1392	28	0.4695	48	0.7431	68	0.9272	88	0.9994
9	0.1564	29	0.4848	49	0.7547	69	0.9336	89	0.9998
10	0.1736	30	0.5000	50	0.7660	70	0.9397	90	1.0000
11	0.1908	31	0.5150	51	0.7771	71	0.9455		
12	0.2079	32	0.5299	52	0.7880	72	0.9511		
13	0.2250	33	0.5446	53	0.7986	73	0.9563		
14	0.2419	34	0.5592	54	0.8090	74	0.9613		
15	0.2588	35	0.5736	55	0.8192	75	0.9659		
16	0.2756	36	0.5878	56	0.8290	76	0.9703		
17	0.2924	37	0.6018	57	0.8387	77	0.9744		
18	0.3090	38	0.6157	58	0.8480	78	0.9781		
19	0.3256	39	0.6293	59	0.8572	79	0.9816		
20	0.3420	40	0.6428	60	0.8660	80	0.9848		

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