

ASSESSMENT OF RAIN WATER HARVESTING POTENTIAL IN MURREE

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BACKGROUND

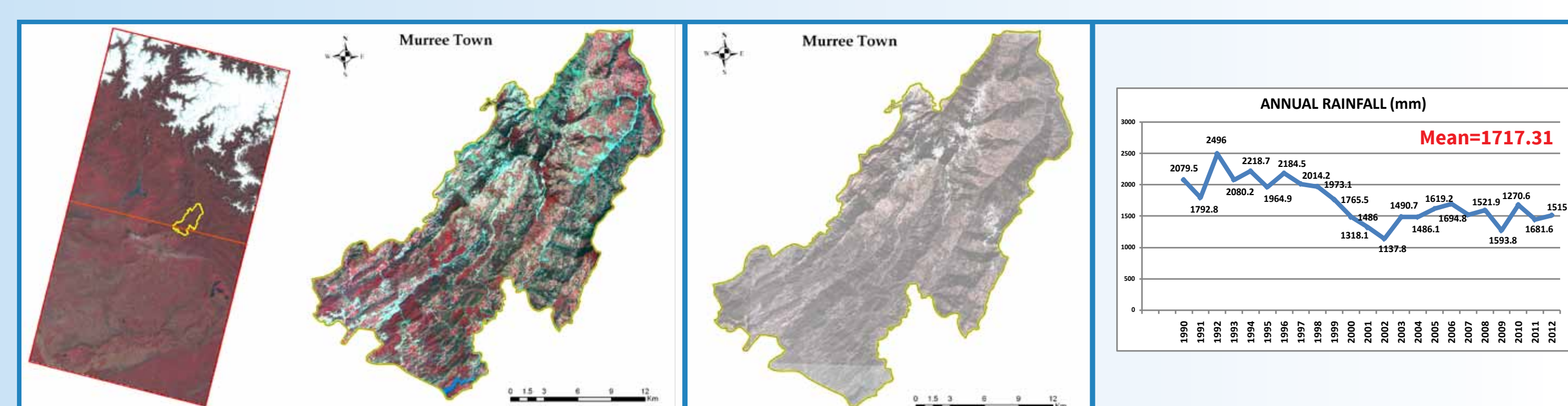
The supply of ample amount of water to the people of Murree at reasonable cost has become a question due to increasing population for water supplying agencies in town of Murree, Punjab, Pakistan. Water is pumped at five stages from far rivers and springs to fulfill water demands of people. Pumping stations and water supplying equipment require enormous operational and maintenance cost. In order to overcome this complexity, more economical solution is needed that is Rain water harvesting (RWH). RWH is the cost effective and efficient technique to overcome the water shortage.

MATERIAL AND METHODS

Datasets:

The primary data sets used in this study are presented below:

- High resolution satellite image
- Landsat Enhanced Thematic Mapper (ETM) + Image
- Rainfall data (Mean annual rainfall)



ESTIMATING RWH POTENTIAL OF MURREE

The total RWH potential is the sum of following:

- Rooftop RWH potential
- Surface runoff RWH potential (Open spaces, non-built-up etc)

So the overall RWH potential of Murree is estimated by adding up the rooftop RWHP and runoff RWHP.

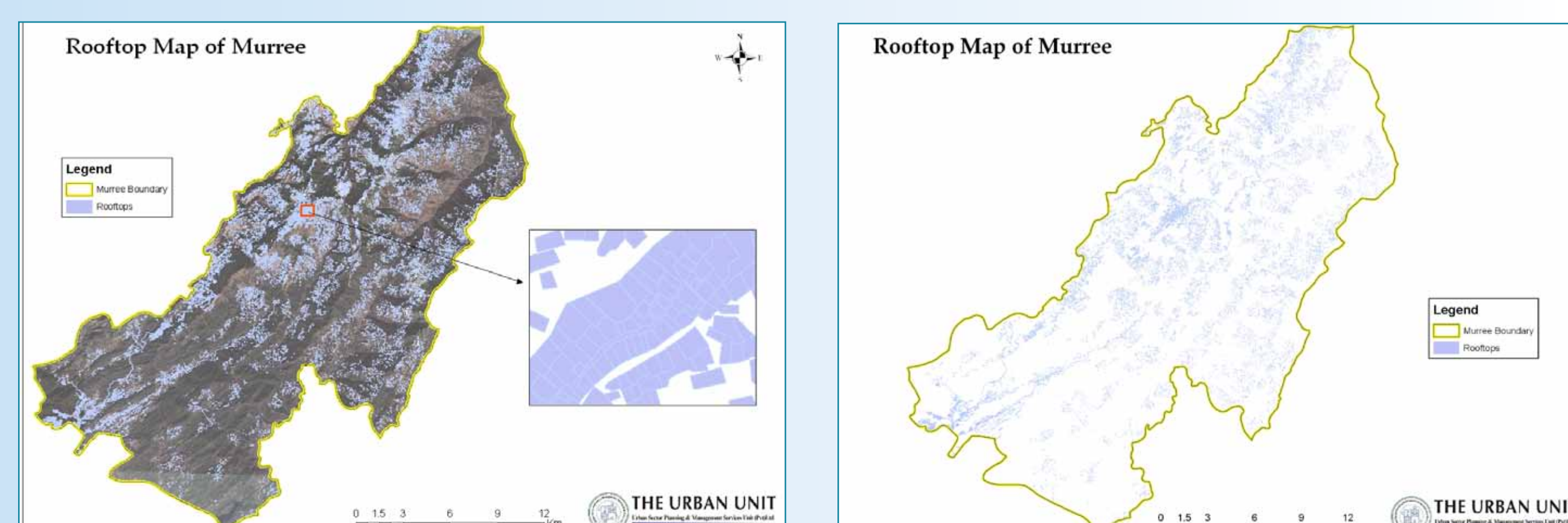
1) Rooftop RWH potential

The area of all rooftops calculated using ArcGIS is 12.055 Km². In Murree rooftops are mainly metallic and tilted. Standard runoff co-efficient of 0.95 is used.

Formula used for RWH potential is:

Roof top Potential (m³) = Total rooftop Area (m²) x Mean annual rainfall (m) x Runoff Co-efficient

Roof top Potential = 12055000 x 1.731 x 0.95 = 19.824 Million cubic meter/year



COST ANALYSIS

Cost Estimation for Rain Water Harvesting Unit Installation

Assumed design age of RWH unit = 10 years

So the total cost of one unit = Installation cost + Maintenance cost (Including Electricity charges) = 1, 63,000 + 16,300 x 10 = 3,26,000 PRs/10 years

Cost for one year = 32,600 PRs

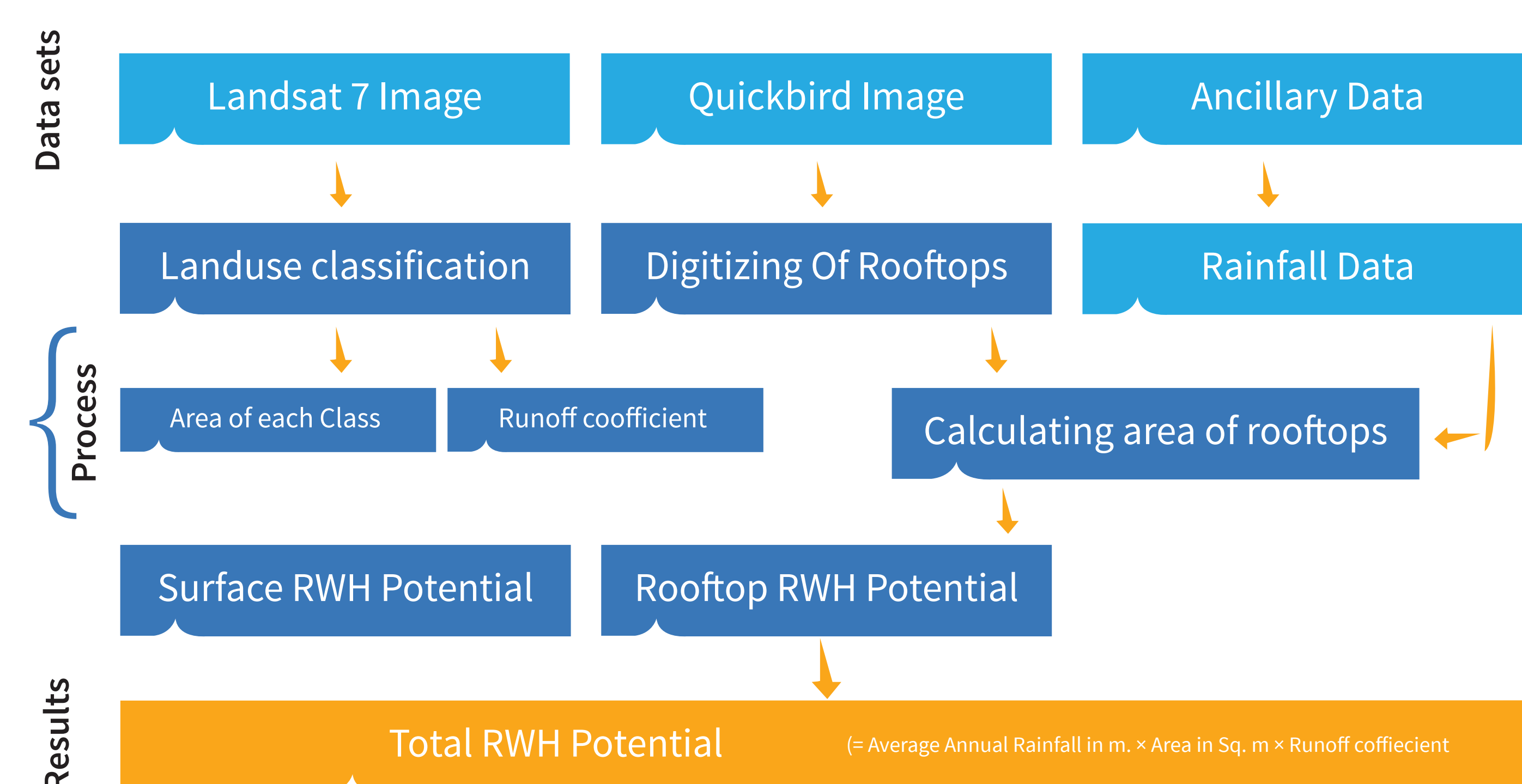
References:

- Punjab Meteorological Department, Lahore, Pakistan
TMA, Annual Operation and Maintenance Estimate (2012). Joint water Board of Murree for 2012-2013
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Orodio J. Odhiambo Alex and Maibo M. Mausuu, (2005). Rain water harvesting in Ten African Cities, Regional Land Management Unit (RELMA in ICARF), 15-3-2005
Patil and Mali (2013). Potential Roof Rain Water Harvesting In Pirwadi Village Of Kolhapur District, Maharashtra (India) - A Geospatial Approach, Volume1 - Issue 4 (2013) pp: 19-24, Journal of Research in Humanities and Social Science

Objectives:

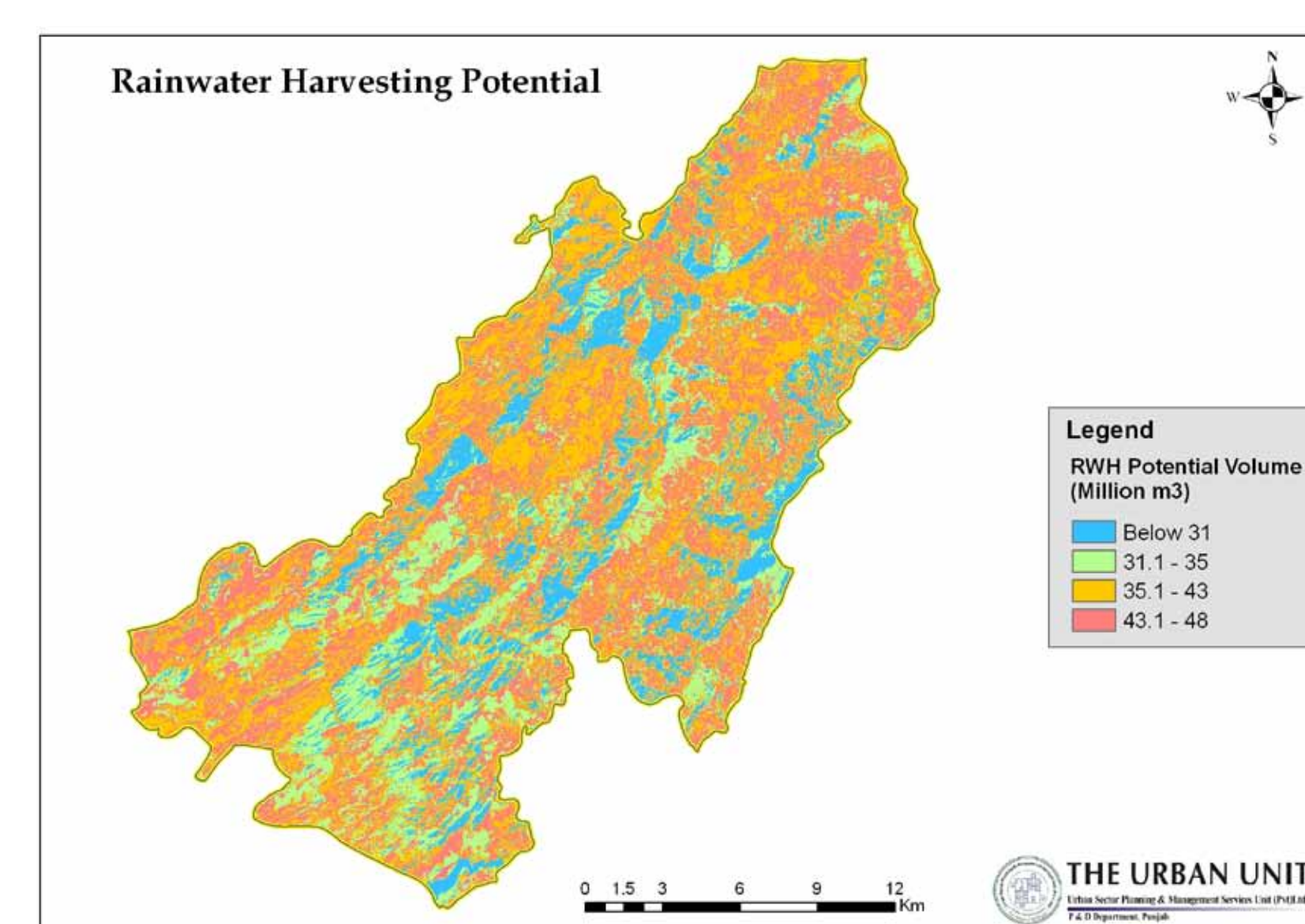
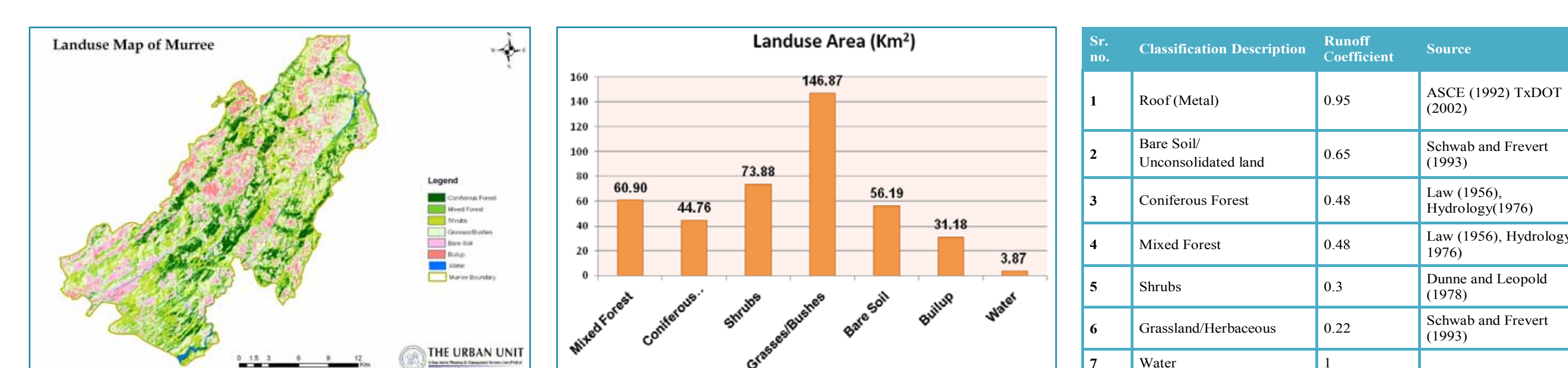
- To assess the rain water harvesting potential (RWH) of Murree town using GIS and RS.
- Cost analysis of RWH unit & comparison with water supply through water tanker

METHODOLOGY



2) Surface Runoff RWH Potential

Supervised landuse classification process is used to categorize the land use of Murree town. The area for each land use class is determined which has been used in the estimation of RWH potential. The runoff coefficient values for different landuse classes are multiplied with their respective areas and RWH potential for each area is calculated. The Potential of all landuse classes are estimated separately and then sum up to find the total RWH potential which is 279.19 Million cubic meter.



3) Total RWH Potential

Total Potential Volume = Rooftop RWH Potential + Surface RWH Potential
= 51.28 + 227.91
Total Potential Volume = 279.19 Million cubic meter / year

Cost of Existing Water Supply Tanker for 10 Marla House

It is assumed that for a 10 Marla house Average Household size is 6. According to WASA Rawalpindi the average daily demand of a person in Rawalpindi is 150 lpcd, so as an assumption the water consumption of a person in Murree is taken as 75 lpcd. The total water consumption by 6 persons is:

- Water consumption of a single person = 75 lpcd
- Water consumption by 6 persons = 75 x 6 = 450 lpcd
- Total Water Consumption for a week = 450 x 7
- Total Water consumption for a week = 3150 liters
- Total Water consumption for a year = 164250 liters
- Assumed Tanker capacity = 1000 gallons
- Cost of Tanker (3785 liters) = 7000 PRS.
- Cost for 1 liter = 1.849 PRS.
- Total cost for 1 year Water consumption = 164250 x 1.849 = 303000 PRs = 0.303 Millions



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