Human water interfaces in Akampadam watershed of Gayathri river basin

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ABSTRACT: *Water is a basic necessity of every human. Human plays a major role in water use and its scarcity. Because only he can use water as a multipurpose liquid. The basic intention of almost all the research work is human welfare. Without human all these studies are meaningless. So, while discussing the problems related to water, it is very essential consider his concern related this mater.*

The study area Akampadam watershed area lies in Palakkad Gap area. The area practicing two seasons of paddy cultivation. Paddy is a water induced crop, so available amount of rainfall is only sufficient to cultivate paddy in one season. For another season they forced to use some external source like canal irrigation. But it is not a sustainable source. Water scarcity is common in every summer months of this watershed.

KEY WORDS: *Canal irrigation, Water scarcity, Population, Effective management, Water Poverty Index*

I INTRODUCTION

An interdisciplinary approach is required to assess water poverty. Water poverty index is a holistic tool to measure these. The concept water poverty index was first introduced by Sullivan (2002). The method WPI holds several specialties than other measures, it is easy to calculate with available amount of data in the country. It takes existing monitoring programmes further by explicit linking socio –economic indicators of poverty drives with water resource assessments, enabling the identification of those communities where poverty, social deprivation, health, environmental integrity and water availability become more explicit, enabling policy makers to identify appropriate mechanisms to deal with cause of these problems (Molle 2002).

Ever increasing demand of water indicates need of effective policy making to manage water resources. An essential pre requisite to effective decision making would be to access consistent information through accurate monitoring backed up by rigorous interdisciplinary science which is mainly depend on a set of reliable and objective indicators. At the same time reporting on performance is a key component of the management of the any institution (Thomson et.al, 2005). Water poverty index offers policy planners an appropriate tool for performance monitoring, benchmarking comparisons, policy progress evaluation, public information and decision making (Garriga et al.). Though Sullivan introduced the concept Lawrance et.al, (2003) applied it into global level, who calculated WPI of many countries of the world. According to him 'water poor' because of two reasons; one is in the sense of not having sufficient water for their basic needs because it is not available. Another reason is they are 'income poor' although water is available they cannot afford to pay for it. There 5 major components to calculate WPI. These are Resource, Access, Capacity, Use, and Environment. As already state WPI is holistic tool it linking social, economic, environmental, physical component together to address the issues of water sector. Each component includes several sub components also. But selections of these sub components are based on availability of data.

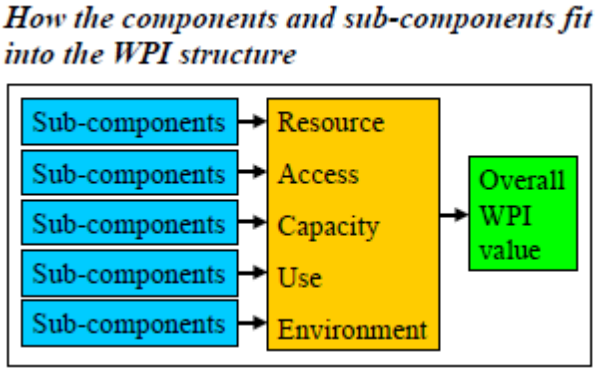

Fig 1. Sub component and component fit into WPI structure (Source: center for ecology and hydrology.)

The scores of the index on a scale of 0 to 100; the highest value is taken to be the best situation-that is the lowest possible level of water poverty-while 0 is the worst. (Wallingford CEH,) thus the final result is a combination of these five components.

Water poverty index will deliver a comprehensive tool to help in water management at a variety of level, and, in particular, make a direct contribution to the process of poverty elimination in poor countries (Sullivan 2002).

There are several methodologies to calculate WPI in various scales. But composite Index Approach is considered as most suitable for community level studies. Some scholars and organization used this approach for their basin level studies. For instance WWF used this approach to Calculate WPI of Indrawati basin. The composite index approach draws on the structure and methodologies used by the human Development Index, and it is based on the idea that a combination of relevant variables can provide a more comprehensive insight into a particular situation than can a single one. In this way, sub variables to represent the 5 key components (Resource, Access, Capacity, Use and the Environment) are collected and summed, to generate a holistic value of the WPI (Wallingford ,2002).

The development of composite index combining these elements need to be done in the transparent manner. To develop appropriate and transparent indicators, standardized data set is required (Olotu Y, 2009).the WPI is calculated using a composite index approach. The five key components are combined using the general expression:

$$\text{“WPI=}\quad \frac{\sum_{i=1}^{N} w_i x_i}{\sum_{i=1}^{N} w_i} \text{”} \quad \text{.....(Equation 1)}$$

Where WPI is the water poverty index value for a particular location,Xi refers to component i of the WPI structure for that location, and w_i is the weight applied to that component. Each component is made up of a number of sub-components, and there is first combined using the same technique in order to obtain the components. For the components listed above, the equation can be re-written;

$$\text{“WPI=}\quad \frac{wrR+waA+WcC+WuU+WeE}{Wr+wa+wc+wu+we} \text{”} \quad \text{……(Equation 2)}$$

Which is the weighted average of the five components Resource(R), Access(A), Capacity(C), Use(U) and Environment(E). Each of the components is first standardized so that it falls in the range 0 to 100; thus the resulting WPI value is also between 0 to 100 (Wallinford,2003).

II. STUDY AREA

The area selected for the study is Akampadam Micro watershed in Gayathri River basin. Akampadam watershed is a part of Gayathri river basin located in the Palakkad Gap. It is located between 10^0 34’N to 10^0 45’N of latitudes and 76^0 36’0”E to 76^0 46’0”E longitudes. .the watershed shares its boundaries with Vadavannur, Pattenchery, Pallassana and Muthalamada Panchayaths. The watershed has a geographical area of 37 sq km.

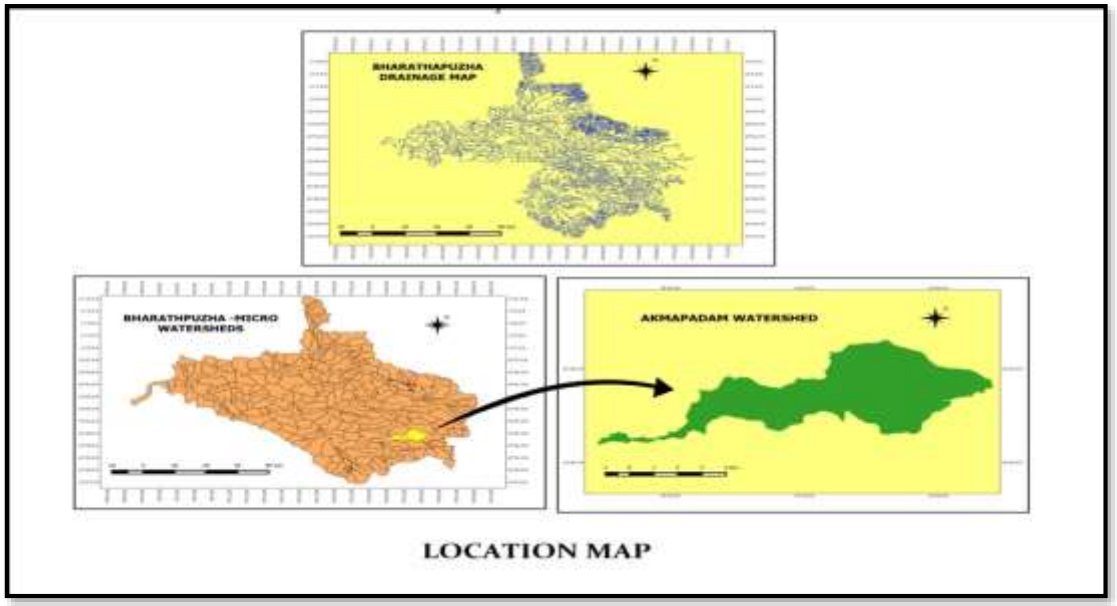

Fig 2. Location map

Location in the Palakkad Gap provides it its specific terrain and climate. The average height of the area is 120m above MSL, altitude ranging between 60 metres and 180 metres. , receiving rainfall both during the NE monsoon and SW monsoon; June-September being the SW monsoon period and October- November being the period of NE monsoon. Isolated summer rains are also received during March and April. December to May is normally dry. The area under study receives an average annual rainfall of about 1500mm. Temperature remains high throughout the year with a summer maximum of about 40^0C and a winter minimum of about 25^0C. As per 2011 census the total population of Akampadam watershed is 43942 person.

III .METHODOLOGY

For WPI calculation both primary and secondary data collection methods were used. Primary data collected with the help of a schedule through a field visit. Cluster random sampling method used to select sample each ward categorized into different clusters. At least 5 samples were selected from each cluster randomly. Totally 150 households has taken as sample. A composite weighted index method devised by Lawrence (2003) was used for the study. But selection of sub component has determined by availability of data. Here calculation of sub-components are based on the methodology of WWF, developed to calculate WPI of Indrawati Basin .but some modification has done due to money and time factor of research. For the calculation of vegetation Fraction realized by using Oceansat-2 Ocean color monitor (OCM2) sensor .The present data for the study derived from www.nrsc.gov.in, which was taken during January, March, June, August and October,2016. Besides, Q GIS and Arc GIS are also used for map making.

IV.THE MAJOR INDICATORS USED IN THE STUDY

The indicators to be used for the various components selected according to data availability in the country (Lawrance et. al, 2002) the main sub components which are used for this study given below;

Table no .1. Sub components/ indices used in WPI study

WPI component	Sub component or variables used
Resource	• Assessment of surface water • External inflows a) Water available by means of irrigation.
Access	• Time required to carry water include to and from • Reliability of pipe water supply

Capacity	• Education capacity index • Income capacity index
Use	• Domestic water consumption • Livestock water use
Environment	• qualitative evaluation of water quality • Reports of crop loss during last five years • Vegetation cover/leaf area index

V. WATER POVERTY INDEX IN AKAMPADAM WATERSHED

Akampadam watershed is located in Gayathri river basin, which is enriched with many other micro watersheds. Apart from Akampadam watershed the four major watersheds in the province are Vadavannur Micro-watershed, Muthalamada micro watershed, Pattenchery micro-watershed, Pallassana Micro-watershed. This study is intended to calculate WPI of each micro-watershed. Which gives exact picture of the area, it also serves to compare the value and identify exact place which experience water scarcity**.**

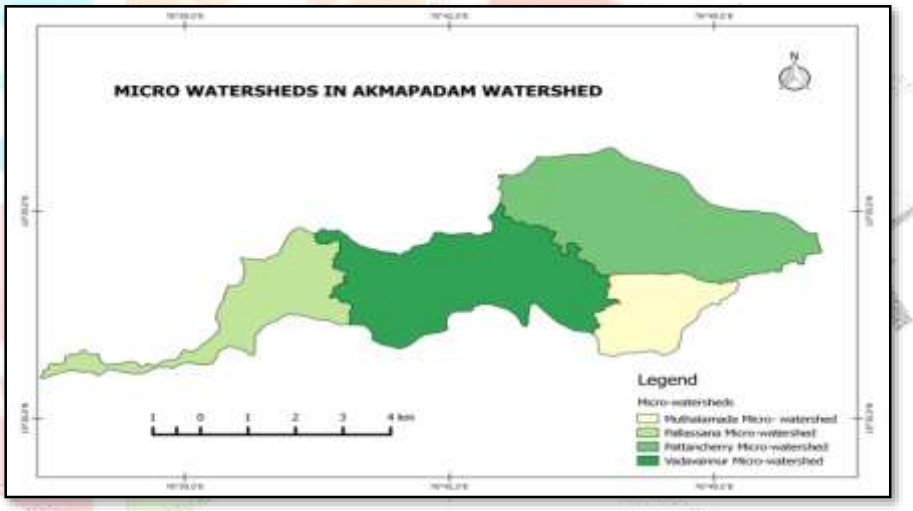

Fig. 3. Micro watersheds in Akampadam watershed

All the components which are used in the calculation are give equal weights, where ∑W=1,besides all the components were multiplied by 20 and added to get the WPI score of 100.the final score of WPI of Akampadam watershed shown in the Table 5.6. It is 67.55. The value of Access ,use and environmental components are comparatively low.

Table no 2. WPI of Akampadam watershed

Resource	Access	Capacity	Use	Environment	WPI
15.75	13.6	17.03	11	10.17	67.55

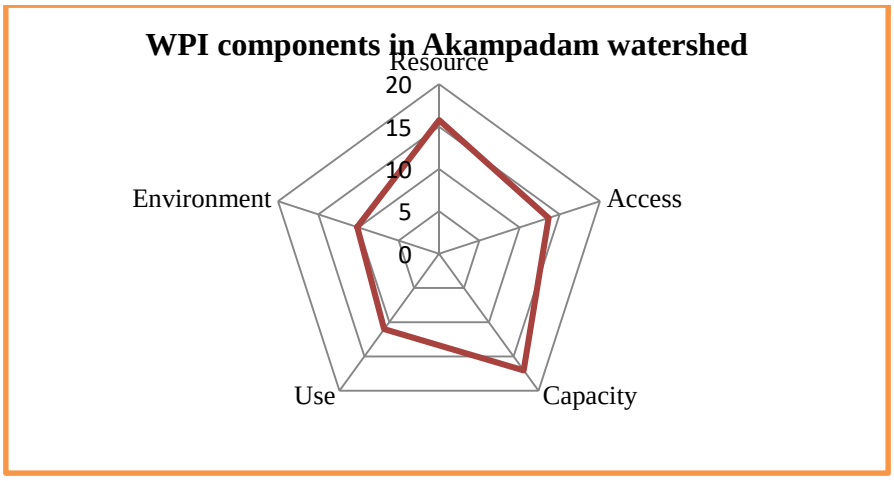

Fig. 4. WPI components in Akampadam watershed

Using the five components and its components department of Economics, Keele University,UK in 2002 calculated an International Water Poverty Index. This measures countries position in Water Poverty Index. According to this study India's WPI is only 53.2.But WPI of Akampadam watershed area almost equal to the WPI of Denmark and Austrailia. . There is no connection between economic status of a country and its WPI value. Some developed countries have low WPI values. Akampadam watershed has Better WPI than Australia. But it is far better value than India, it is only 53.2. In the study area resource score and Capacity score are comparatively high. Use component value is the result of Domestic water usage of the household; agricultural usage is not included in the case. Access index is comparatively low.

Table no.3 WPI of Micro watersheds

Name of the watershed	Resource	Access	Capacity	Use	Environment	WPI
Pallassana	15	12	18	13	9.91	69.91
Pattenchery	15	12	18	13	10.53	68.53
Vadavannur	15	13.2	17	11	11.87	68.07
Muthalamada	17	14.5	18	13	10.53	71.03

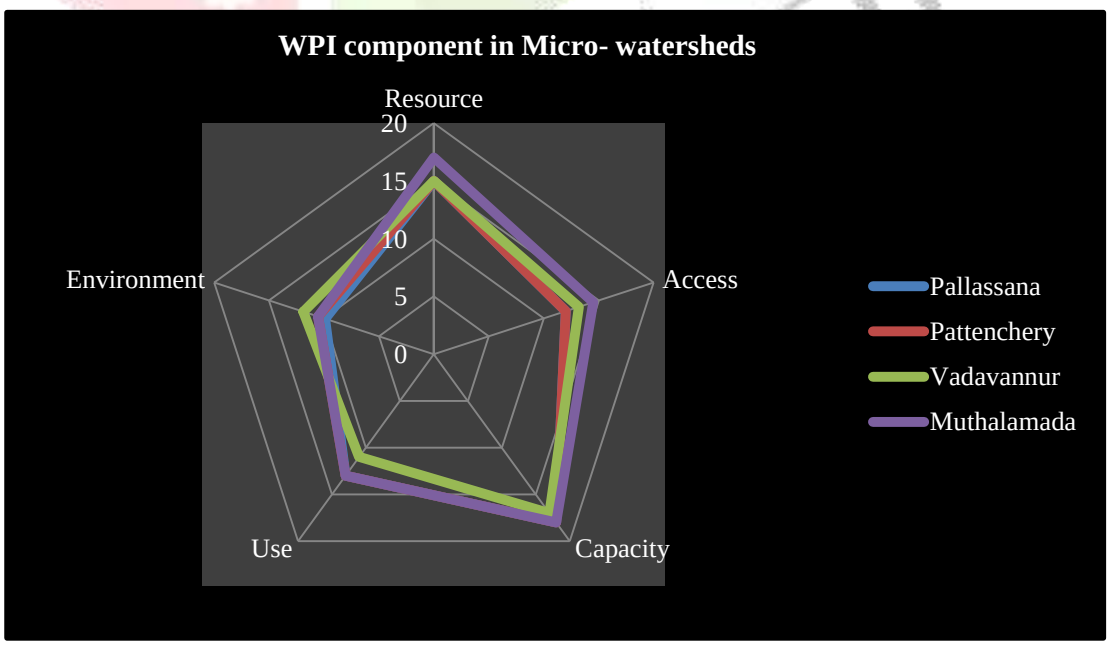

Fig. 5. WPI component in Micro-watersheds

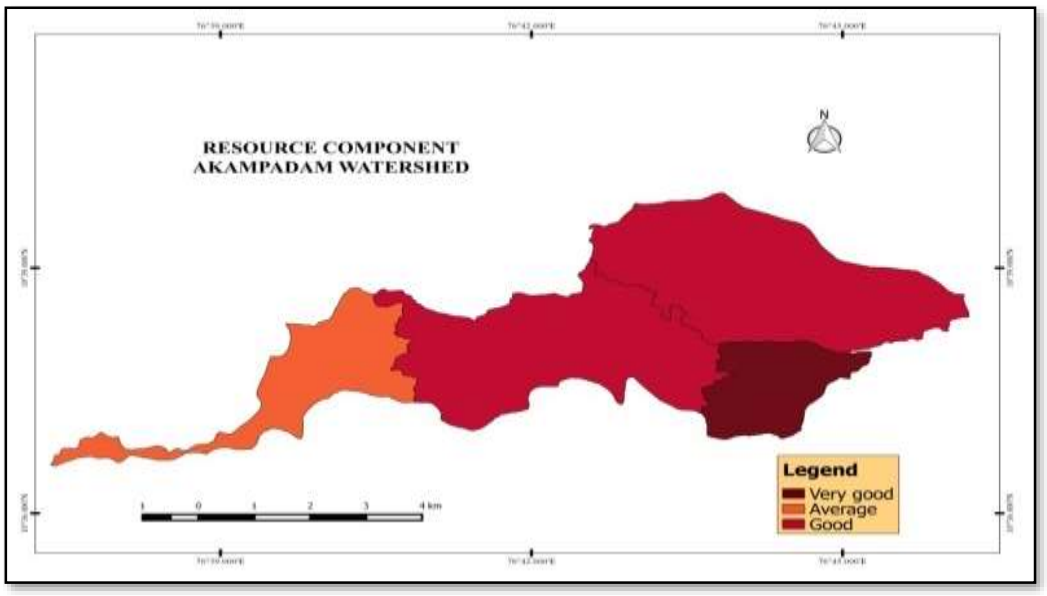

Fig. 6..Resource component in Akampadam watershed

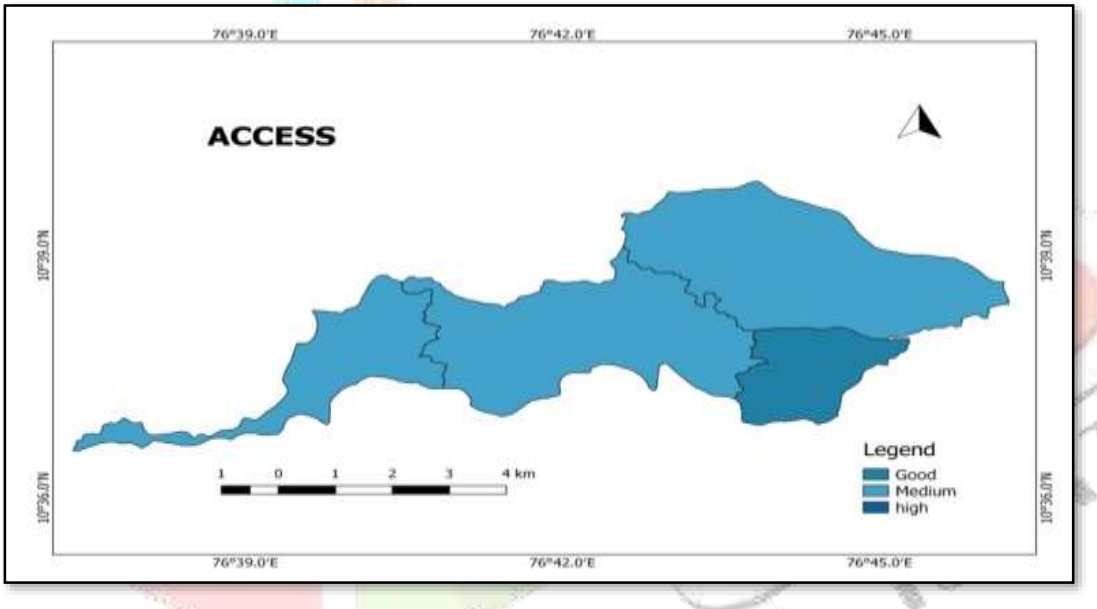

Fig.7. Access component of Akampadam Watershed

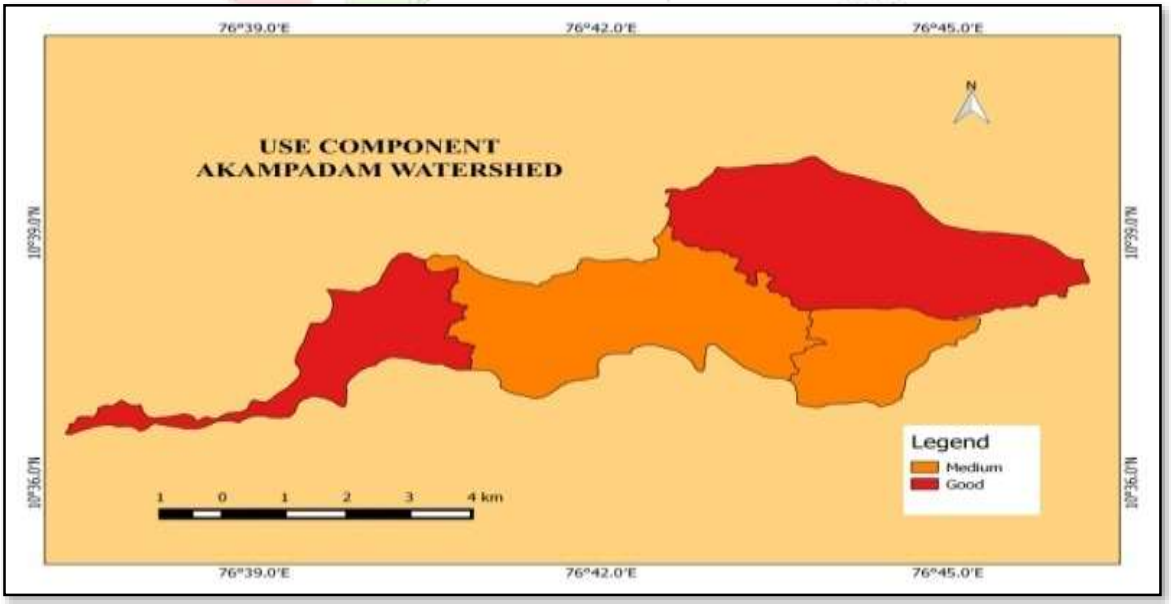

Fig.8.Use component of Akampadam watershed

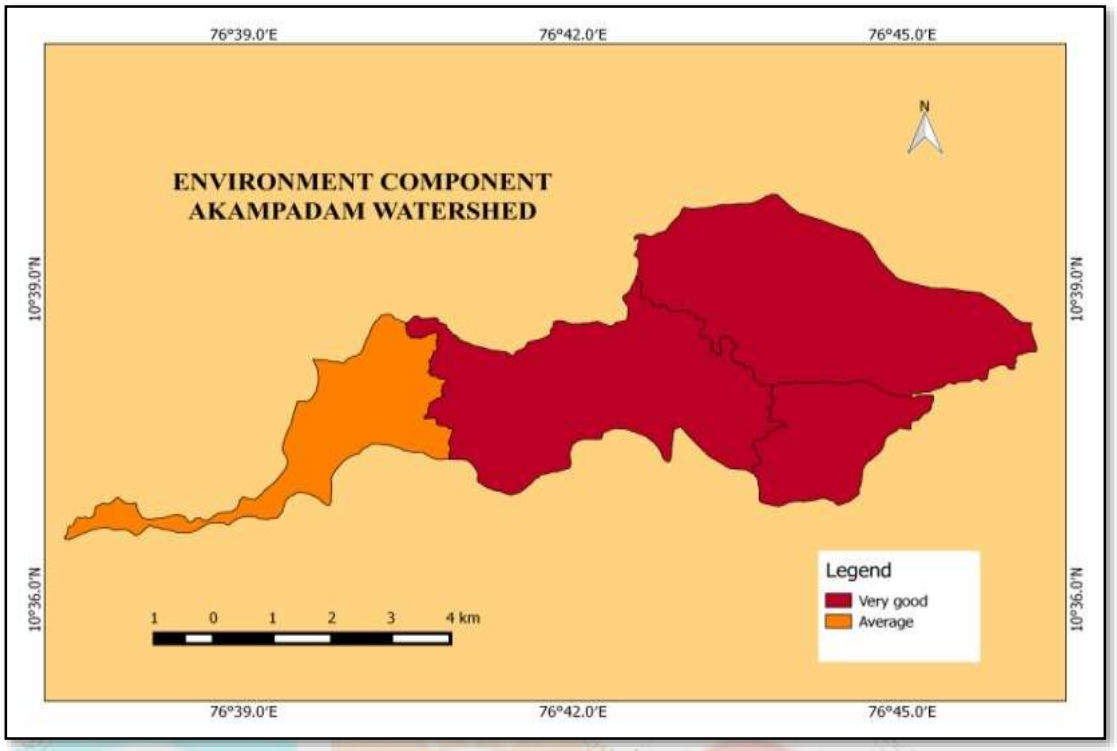

Fig.9. Environmental component

The water poverty map of micro-watersheds clearly illustrates the exact problems of different location in Akampadam watershed area. There is only slight difference in Water Poverty Index value in these areas. But a problem of each area is different. Muthalamada Micro-watershed enjoys high WPI value. The radar diagram shows (Fig 5) that almost all lines maintaining same path and it is very much resemble the radar diagram of Akampadam watershed.WPI scores which show the component scores that indicate strength and weakness of every location. The WPI value of Akampadam watershed is 67.55. It is almost equal to the WPI value of Uruguay. There is no connection between economic status of a country and its WPI value. Some developed countries have low WPI values. Akampadam watersheds have Better WPI than Australia, which falls in safe range. The resource value and capacity values are high among other components. But its accessibility is relatively low. In some parts of Pattenchery region they travel more than 50 m to collect water. Recently Pattenchery region reported some serious water born diseases like Cholera (Kaduvanchira).water quality is one of the main problems in almost all parts of the watershed. But it is highly visible in Pattenchery and Vadavannur areas. Some wards in Vadavannur area depending Meenkara(dam) water for their drinking purpose. But people are not satisfied in its quality. Micro-watersheds were selected from Akampadam watershed area has enjoyed similar topographical and climatic condition besides; social and economic conditions are almost similar. Thus drastic differences in WPI values are not appear. Almost all micro-watersheds enjoy high WPI value. But Muthalamada region has high WPI values.

VI.CONCLUSION

The study or the core part of the study is Water Poverty Index. It has been demonstrated that Resource component is abundant. There receive water from two sources: rainfall and irrigation water (canal water). But its accessibility is comparatively less. The implementation of Jalanidhi drinking water project, it could solve drinking water scarcity problems for an extent. But people more concern about its quality and quantity. Sometimes people forced to drink same water. Recently Pattenchery region reported some serious water born diseases like Cholera. In these case physical or Climatic study is not a tall sufficient.WPI can be taken as holistic tool to link all the diverse institution of Economics, Environment, Society etc.WPI value of Akampadam watershed is far better than India's WPI .It is even equal to some developed countries like Denmark and Australia. But the selection of subcomponent of each study is different .so the comparison of the different studies are little bit complicated.

Generally the whole study is helpful to address the problem of water scarcity in dimensions; mostly almost all the water scarcity studies only identify water scarcity and its severity. All these studies indicate the fact that central and North eastern part of the study area experience more water stress and related problems. But WPI calculation helps planners to identify the real

problem of water scarcity and its factors. It addresses both availability and accessibility of safe water. In Akampadam watershed area also drinking water is available. But its quality is average. So, the study is helpful to identify the problem areas and implementation effective plans.

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