Potential Development of Rainwater Harvesting in Malaysia

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Abstract: Rainwater Harvesting lately has gained recognition as a sustainable means of domestic water supply globally. Malaysia as a country which received a very high rainfall throughout the year is not fully capitalized on this. Even though, traditionally it was done in remote area since long time ago using a primitive way of collecting rainwater from the roof or surface before it touch the ground and stored for domestic usage. The resurgence of rainwater harvesting is due to the paradigm shift in concept of resources and supply and supply water as demand increased due to the increase of the world population. The Malaysian Government has recognized that rainwater harvesting contribute toward National Water Conservation Policy. It has made a commitment to revise the Guidelines for Installing a Rainwater Collection and Utilization System in the Ninth Malaysian Plan within a period of 2006 – 2010. Encouragement from the government through various means of awareness program and incentive has increased the number of rainwater harvesting system in various building types. This paper will cover the potential development of rainwater harvesting which has been implemented in Malaysia. It will also explain the process of the Malaysian Government to encourage on the rainwater harvesting system.

Keywords, Rainwater Harvesting, Policy, implementation, Potential, awareness

Introduction

The Rainwater harvesting is the simple collection or storing of water through scientific techniques from the areas where the rain falls. It involves utilization of rain water for the domestic or the agricultural purpose. The method of rain water harvesting has been into practice since ancient times. It is as far the best possible way to conserve water and awaken the society towards the importance of water. The method is simple and cost effective too. It is especially beneficial in the areas, which faces the scarcity of water.

Traditionally, rainwater harvesting is the collection of water volume from raindrops. Rainwater harvesting has been the main source of water supply for portable and non portable uses in the old days and the method used was simple and primary. People usually make complaints about the lack of water. During the monsoons lots of water goes waste into the gutters. And this is when Rain water Harvesting proves to be the most effective way to conserve water. We can collect the rain water into the tanks and prevent it from flowing into drains and being wasted. It is practiced on the large scale in the metropolitan cities. Rain water harvesting comprises of storage of water and water recharging through the technical process.

Rainwater Harvesting in Malaysia

In March 2006, the Prime Minister has chaired and launched the National Water Resources Council (NWRC) which has two main agenda viz. Rainwater and Groundwater. The Ministry of Housing and Local Government (MHLG) has taken
important steps in implementing Rainwater Harvesting (RWH) and formulated by-laws nationwide take it compulsory for bungalows, factories and schools/institutions to install rainwater harvesting system in their respective buildings.

After 1998 drought, a study of alternative source of water supply is being carried out. In 1999, a guidelines for installing a rainwater harvesting policy in Malaysia was introduced. It aims is to reduce dependence on treated water.

Malaysia received 990 billion cubic metre of rainwater annually. Surface runoff water account for 566bcu.m while 360bcu.m evaporates and 64bcu.m end up as ground water.

Water is an essential component for sustaining life. Even though 70% of our earth is covered with water, only 3% of the water is fresh. Out of this 2% is locked in the form of ice and it is only the balance 1% that is being recycle that flow into the lakes and rivers (J.D Seghal 2005). By 2025, the world population will be affected by moderate to severe water shortage (UN 1997). Malaysia will not be spared from the impending water crisis.

In order to avoid water crisis in 1998, a proactive step must be taken to avoid acute water shortage in future.

To Date, 2 Federal Government buildings, Few Terrace houses development, Individual own houses and mosque have implement the rainwater harvesting system. Few Local Authorities ( Johore, Penang, Sandakan & Shah Alam) has implement the rainwater collection system in their housing development.

RAINWATER HARVESTING POLICY IN MALAYSIA.

Awareness is importance of in implementing any new idea. Rainwater harvesting is however is not new in Malaysia. Great grandfathers used to harvest rain water in large clay container for various uses. Now The Malaysian government is looking at rain water as a resource as well. A committee is formed to look into planning and its implementation. Now it is compulsory for certain new building to integrate the system. Besides, a guideline is provided for interested parties.

Rain water is free. Research has been initiated by the National Hydraulic research Institute of Malaysia (NAHRIM), and the first rain water harvesting was implemented in Damansara; the price was about RM 7000-10000.

NAHRIM has been aggressive in promoting rain water harvesting. National Urbanization Policy (NUP) acknowledged that cities need to improve water management efficiency, water recycling, and rainwater harvesting system. The Ministry of Natural Resources and Environment (NRE) is responsible for promoting rain water harvesting since its establishment in 2004 and to conduct research of water hydraulic and water environment. They have done 3 pilot projects on Government office, Mosque and a residential house. They have also designing and installing RWH system for several school.

In August 2006, Town Country Planning and Development formulated that National Urbanization Policy (NUP) which stress that:

- Cities and urban area are required to improve their water management efficiency.
• Use alternative sources and non conventional rainwater harvesting system.
• Should provided possibility of water recycling.

The Ministry of Energy, Water and Communication (MEWC) has been appointed as the implement agency that also involved in RWH. In addition, in March 27, 2006, Government announced that is mandatory to implement RWH to large building like factories, school/institution and bungalow.

The rainwater guidelines was approved by the Malaysian cabinet in 1998. The guidelines approved is not a bye law and not mandatory. A committee was set up to look at the possibility to regulate the rainwater harvesting system and to make it mandatory for building in Malaysia. For a start the cabinet has directed the guidelines to be implemented for buildings in Putra Jaya, the administrative centre for Malaysian Government.

It is explicable legal instrument can be used to implement government policies regarding RWH. For Example in India where 98% of it citizen utilize rainwater as the alternative source of water supply. Hence, they make it compulsory for RWH and is stated in their Building Law and legislation. It can be either as Substantive Legislation or Subordinate legislation. Therefore, amendment is required to various act, such as:
• Town country planning Act 1976
• Environmental Quality act 1974
• Street, drainage and Building Act 1974.

There are few steps that can be taken to encourage Rainwater Harvesting. They are as follows:

1. Amendment to Uniform Building by-Law.

MHLG has been instructed by the government to prepare a guidelines on Rainwater Collection and Utilization (SPAH) which has been tabled in the cabinet in October 2008. The purpose of the guidelines are:
i. As a references for those who are required to install SPAH
ii. To provide Information on quality of Rainwater and the rationale behind the technique.
iii. To encourage possible appropriate innovative alternatives which offer real advantages.

By amendment of the UBBL it will made mandatory for the Rainwater harvesting system to be installed to every development.

2. Economic Instrument.

Economic instrument can be classified into:
• Provision of subsidies, includes subsidies on cost of material and installation, e.g. Japan, Germany & Australia.
• Tax Rebates, includes incentives from government to homeowner, manufacturer, Housing Developer, contractor supplier who are involved in production and installation of the system, e.g. India.
• Rebate to property owner, which has successfully implemented in Australia.
• Education and Raising awareness, includes installation of examples, road
show and campaigns through mass/electronic media.

- Apply Limitation, which has already done in Australia.

RAINWATER HARVESTING SYSTEM

Components of RWH are as follow:

- Collection/catchments area, includes roof and surface area
- Conveyance system, includes gutters and down pipes;
- Filtering System, includes first flush;
- Storage facility, includes tanks; and
- The distribution system, which includes plumbing (to toilets, washing machine and general use).

The diagram of the rain water harvesting system, is comprise of Collection/catchments area, Conveyance system, Filtering System, Storage facility, and the distribution system for domestic as shown in the diagram 1.

8.6 MALAYSIAN CASE STUDIES POTENTIAL PROJECT

Case studies by NAHRIM showed that the project can be successfully implemented. Some examples are the Terrace houses in Sandakan, Damansara, One Utama Shopping Complex, Taman Bukit Indah Mosque, and DID headquarters.
system can save money in the long run showed.

Diagram 4. Showing the new block of Faculty of Science and Technology which will be installed with the rainwater harvesting system.

All the rooftop have the potential to harvest the rainwater. But in this case, only the B and E area was determined as catchments area. Assumed there is a five hundred users in the building and flush toilet one time in a day. Water consumption for each flush is 6 liters water.

Daily water consumption for toilet flushing is:

\[ 500 \times 6 = 3000 \text{ liters} \]
\[ = 3 \text{ cu metre} \]

Monthly water consumption is:

\[ 3 \times 31 = 93 \text{ cu metre} \]

A study of rainfall pattern is done. A collection of rainfall in 2007 has been used for the purpose of this study. Rainfall data and possible amount of rainwater to be collected as shown in table 1.

From the above table, we can calculate the amount of rainwater that can be harvested on January:

- B catchments area = 539.16 m²
- E catchments area = 551.5 m²

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall Pattern</th>
<th>Volume of Water Harvested (m³)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lab Block 1859.86 m²</td>
<td>Dean Block 2457 m²</td>
</tr>
<tr>
<td>January</td>
<td>120.5</td>
<td>156.09</td>
<td>207.24</td>
</tr>
<tr>
<td>February</td>
<td>157.0</td>
<td>204.40</td>
<td>270.01</td>
</tr>
<tr>
<td>March</td>
<td>337.0</td>
<td>436.64</td>
<td>579.52</td>
</tr>
<tr>
<td>April</td>
<td>255.0</td>
<td>331.99</td>
<td>438.79</td>
</tr>
<tr>
<td>May</td>
<td>179.0</td>
<td>233.00</td>
<td>307.78</td>
</tr>
<tr>
<td>June</td>
<td>186.0</td>
<td>242.14</td>
<td>319.88</td>
</tr>
<tr>
<td>July</td>
<td>159.5</td>
<td>207.69</td>
<td>274.19</td>
</tr>
<tr>
<td>August</td>
<td>165.5</td>
<td>215.42</td>
<td>284.67</td>
</tr>
<tr>
<td>September</td>
<td>226.5</td>
<td>294.84</td>
<td>389.55</td>
</tr>
<tr>
<td>October</td>
<td>483.0</td>
<td>628.82</td>
<td>830.71</td>
</tr>
<tr>
<td>November</td>
<td>210.5</td>
<td>273.37</td>
<td>358.03</td>
</tr>
<tr>
<td>December</td>
<td>233.5</td>
<td>297.47</td>
<td>392.98</td>
</tr>
</tbody>
</table>

Total  | 2713.           | 3521.88                      | 4653.35                      | 8175.23 |

Table 1. show the Rainfall Pattern in Kajang for the year 2007 and possible amount of rainwater to be collected.
Total area of catchments = 539.16 + 551.5 = 1090.66 m²
Volume of rainwater can be harvested
= area of catchments x average annual rainfall of January x runoff co-efficient
= 1090.66 x 120.5 x 0.7
= 91 997.17 litres / 92 m³

Rainwater that is collected on the rooftop of the building is diverted by gutter through a rainwater downpipes to a collection tank, from which it flows through a filtration chamber into the storage tank. The collection tank size is determine by the lowest daily rainfall (base on rainfall data for January 2007) that can be harvested by B and E area.

On 2nd January 2007, volume of rainwater that can be harvested is calculated as follow:
- B area = 10.00 cu metre
- E area = 10.23 cu metre

CONCLUSION

Rainwater harvesting has the potential to be implemented in Malaysia seen we have a very high quantity rainwater source (more than 2000mm per year). It will also reduce rainwater input in the drainage system. This will help to reduce the environmental loading that will cause the overloading to the system which will cause flooding and health problem. Rainwater harvesting will minimizing the dependence on public water supply and this will avoiding waste of natural sources. Rainwater harvesting is an important element of sustainable architecture especially for control and management of the water crisis in future. Other than as source of water supply, it can also contribute to prevent hot spot to occur as a result of environmental drying where water is not recharge back to the earth, flood mitigation, global warming, acid rain and air pollution.

Please be reminded that we do not inherit the Earth from our ancestor but instead borrow from our children and all the living creatures. Therefore we have to save our earth for future generations.

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