



Monograph Series

Meenvallom

*A Pioneering Initiative for
Local Hydel Projects in Kerala*

Integrated Rural Technology Centre

Meenvallom

**A Pioneering Initiative for
Local Hydel Projects in Kerala**

IRTC Monograph Series

Integrated Rural Technology Centre

Mundur, Palakkad, Kerala-678592

[Grant-in-Aid Institution of KSCSTE]

Book Name: Meenvallom; A Pioneering Initiative for
Local Hydel Projects in Kerala

Edited by: Parvathy T.

Type: Monograph

Series Edition: IRTC Monograph Series-1 First

ISBN: 978-81-941237-0-5

First published: August 2019

Published by: Integrated Rural Technology Centre

Design: Prajeesh A.

Price: INR 200

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Former nuclear scientist at Bhabha Atomic Research Centre (BARC), mentor and guide of Peoples' Science Movements in India and Former Director of IRTC

Foreword

The three megawatt Meenvallom Small Hydro-electric Project is the first SHP taken up by the Palakkad Small Hydro Company Ltd, a company promoted by Palakkad District Panchayat. All the data, such as, year round in flow, flow duration curves, alignment of roads, penstock alignment, etc. required for its design were generated by the Integrated Rural Technology Centre (IRTC), the research and development institution of the Kerala Sastra Sahitya Parishat (KSSP). IRTC prepared the DPR including the EIA and submitted to the District Panchayat in 1998. However, it took more than eleven years to get all the clearances from the KSEB (design approval and power purchase agreement), forest clearance, environment clearance and finance closure and could start the work only in 2009.

If there was a 'Single Window' system to get all these within three months or so, this project could have been commissioned by 2002 or 2003. It took more than eleven years to get all these clearances, leading to a production loss of about 90 million units of energy and cost escalation of INR 100 million, i.e. from INR 100 million to INR 200 million. At present, the government had offered the Single Window Clearance to large scale foreign and private investors in the state.

This monograph gives the story of how the state government and various agencies such as forest department, environment department, etc. are responsible for time and cost overruns. The power station was commissioned in 2014. And till now PSHC has supplied to the grid 37 Million units of energy to KSEBL. Till date PSHC has paid back INR 83.3 Million to NABARD towards Loan amount and Interest.

The IRTC functioned as the Technical Consultant to the Palakkad District Small Hydro-electric Power Company and supervised the construction and commissioning of the Meenvallom Small Hydro Project. Currently, the IRTC is functioning as a Consultant for the second power station, the one MW Palakkuzhy SHP project of the PSHC.

The finance for all the remaining projects can be raised from the public. Provisions can be made in such a way that, for those who pay in advance an amount of one lakh rupees for the project can be given yearly 1200 units of free electricity for 20 years. Also, finance can be mobilized in this manner, for the proposed pumped storage projects such as Poringal-Sholayar-Edamalayar also.

Chapter - I

Advent of Electrical Power in Kerala


The production and distribution of electric current in Kerala do not have a long history. Kerala, the southernmost district in India is a land rich in water bodies. The state has 44 rivers and most of them are rain fed. Till the recent past, hydroelectric power is the only source of electricity that the state depended upon. It was with the establishment of a 450 KW small hydro project in 1904, by the Kannan Devan Hills Produce Company Ltd, a private enterprise in Muthirapuzha, the first initiative of electrical power generation started in Kerala. It was after a spell of 17 years that the electricity department of erstwhile Travancore State started setting up a series of diesel

generating stations including Thiruvananthapuram, Kollam, Kottayam and Nagarcoil by 1934. By that time, the possibilities of hydroelectric generation attracted the attention of the authorities

The first of these ventures was the Pallivasal Hydroelectric Project. This was built by the electricity department of Erstwhile Travancore State. The project was commissioned in 1940 with a capacity of 13.5 MW. The demand for electricity grew steadily thereafter. With the growth of the distribution system and a small industrial system in Aluva, the demand for electricity was further accentuated. In order to meet this growing demand, the station

was upgraded to 37.5 MW in 1951. Further, two more stations using the tailrace of Pallivasal Sengulam and Neriya Mangalam were planned. Gradually, growth in electricity consumption acquired momentum in the domestic, commercial and industrial sectors. With the formation of Kerala state in 1956, the department of electricity was reorganized as Kerala State Electricity Board (KSEB). Kerala, being a land of mountains and rivers, turned out to be an attractive field for hydroelectric generation.

The first elected government in Kerala post-independence came to power in 1957 under E.M.S. Namboothiripad. This government



Kerala, being a land of mountains and rivers, turned out to be an attractive field for hydroelectric generation.

made a series of plans for the long term development of the State. Under the ministry of V. R. Krishna Iyer, the department of irrigation prepared a water resources management plan. The electricity department prepared a plan to explore the hydro power potential of Kerala. This included a large number of projects like Sabarigiri, Idukki, etc. Most of these projects were implemented over time. Many of the remaining projects were later subjected to the nuances of interstate disputes or issues related to environmental.

Kerala continued to depend solely on hydroelectricity till the middle of 1980s. Kerala was considered as an electricity surplus State and was exporting hydro power to neighbouring states. However, it had been pointed out in 1975 itself that if the suppressed demand (due to issues in transmission and distribution) is freed, the demand will increase, and by 1983 Kerala would become a deficit state in terms of electricity. After the commissioning of Idukki project, the only project on the anvil of KSEB was the

Station	District	Capacity (MW)	Year
Pallivasal	Idukki	37.5	1940
Peringalkuthu	Thrissur	48	1957
Sengulam	Idukki	48	1957
Neriyamangalam	Idukki	45	1961
Panniyar	Idukki	30	1963
Sabarigiri	Quilon	300	1966
Sholayar	Thrissur	54	1966
Kuttuyadi	Kozhikode	225	1972
Idukki	Idukki	780	1976
Kallada	Kollam	15	1986
Idamalayar	Ernakulam	75	1987
Malankara	Idukki	10.5	1987
Lower Periyar	Idukki	180	1997
Kakkad	Pathanamthitta	50	1998

List of major hydro-electric power stations built in Kerala

Silent Valley hydroelectric project. The Silent Valley forest was an internationally known climax tropical forest, a veritable gene pool. Scientists and environmentalists raised opposition to the destruction of the forest that would result from the project. A long-drawn controversy ensued and finally resulted in the abandonment of the project.

In 1983, as predicted earlier, Kerala had to import substantial quantities of thermal energy from Neyveli. The hydro projects other than Silent Valley too were environmentally questioned. The Interstate water dispute also arose in connection with various projects. Hence, no new major project was taken up afterwards except continuing and completing the projects under construction, namely Idamalayar, Kakkad, Periyar, etc. It was under this situation that small hydro



projects having a relatively low environmental impact began to be considered seriously.

Potential of Small Hydro Projects

During 1983 to 1985, a detailed study for identifying the potential for small and mini hydro electrical power projects in the Western Ghats, named "Western Ghats Coordinated Research Programme" was carried out by the State Committee for Science, Technology and Environment (STEC), which was later renamed as Kerala State Committee on Science, Technology and Environment (KSCSTE). Professionals and students from various engineering colleges in Kerala came forward to conduct research on the same and find out the potential of the hydel sources in the Western Ghats region. An assessment of the mini- micro hydro potential of the state was undertaken by the project team and a report was submitted in 1985. They identified around 57 potential sites with a total power generation capacity of 70 MW. Of these, six sites were identified as most promising:

- Kakkadampoyil, Kozhikode district
- Meenvallom, Palakkad district
- Cheruvakkil chola, Thrissur district
- Killiyar kadamkuthu, Thiruvananthapuram district
- Palaruvi, Kollam district
- Lower Meenmutty, Thiruvananthapuram district

More studies were conducted to understand the relevance and

Study & Year		Number of Small Hydro Potential Sites	Calculated potential (MW)
STEC Study 1983-85		57	70.00
ESMAP Study 1983-91		7	27.45
KSEB - CEA Surveys 1993		76	405.00
IRTC - KRPLLD Study			
1997-99 (5 Districts)		31	62.40
EMC Survey 2000		374	769.45
TESM - ANERT Study 2007-2009	30% production	927	336.00
	70% production		55.00

Studies on Small Hydro Potential in Kerala

feasibility of small hydro projects were during 1980s. Studies such as "Energy Sector Management Assistance Programme" (ESMAP) coordinated by UNDP and World Bank, and feasibility reports by the Central Electricity Authority were a few among them. The study reports showed the potential for small hydro projects, but none of them were taken forward for implementation.

Major problems faced with regard to implementing these hydroelectric projects were;

- Relatively high initial investment (because of its isolated implementation, lack of standardization of equipment, and installations, conventional methods)
- Lack of interest for small projects from the side of KSEB

The rivers in Kerala, like other peninsular rivers, are rain fed; unlike in the Himalayas where rivers are both rain fed and snow fed. Most of the rivers remain dry for six months during the winter

and summer seasons. This fact is supported by an analysis of Plant Load Factor (PLF) of existing Small Hydro Power plants. Plant Load Factor quantifies the time for which power is generated in a year. A higher PLF implies higher energy generation.

The small hydro projects in China and many other countries have demonstrated success and profitability. But KSEB believed that such small projects are irrelevant compared to the larger scale projects. Hydel engineers with a conventional outlook have always been arguing that small hydro projects are more expensive than the larger ones. The possibilities for cost reduction were not taken into consideration. In a nutshell, bureaucracy, technocrats and the traditional thinking in favour of big hydro projects did not provide headway to the arguments in favour of small and mini hydro electrical projects in the state.

Chapter - II

Intervention by IRTC

Integrated Rural Technology Centre (IRTC) was established in 1987 by the Kerala Sasthra Sahithya Parishad (KSSP) to adapt research and development work in areas related to science, technology and social science that create substantial impact in the lives of people, especially the underprivileged section. The organization took up various initiatives to understand and implement low cost housing, high efficiency chulhas (wood stove), municipal waste management,

energy and water management and several related sectors that are closely connected to the needs of the common man. In the field of energy, IRTC decided to do a deeper analysis of the small hydro sites already identified.

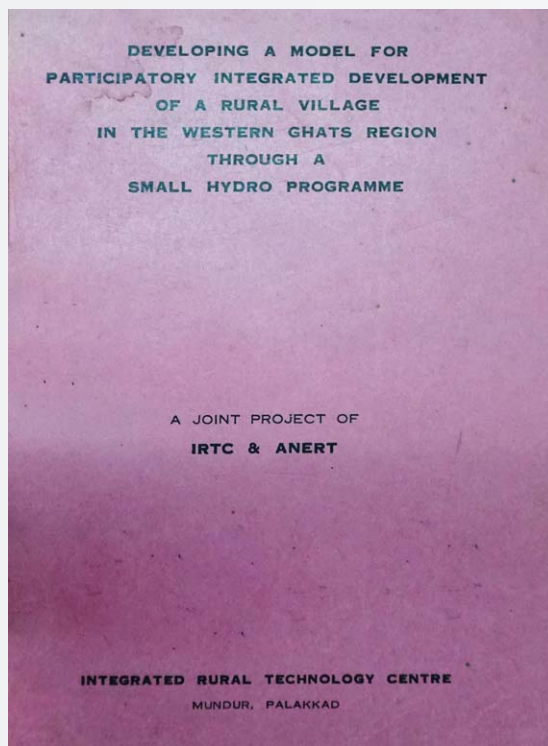
IRTC also conducted a study on potential sites for Small Hydro Projects in Kerala with a view of deriving some economic benefits through the standardization of unit machine size. One reason for the comparatively high cost of the small hydro equipment

is that the turbines, usually one of a kind, require a high cost for design and development. If it is possible to choose a large number of turbines for identical specifications, the development as well as the fabrication cost will be reduced considerably. Hence, IRTC took up the project “Developing a Model for Participatory Integrated Development of a Rural Village in the Western Ghats Region through a Small Hydro Programme” with the support of



STEC and the Agency for Non-Conventional Energy and Rural Technology (ANERT). In 1994, the Department of Science, Technology and Environment decided to support the coordinated project proposal submitted by the IRTC. Along with it an amount of INR 2, 00,000 was sanctioned for the project. The scope of the project was to apply techno-economic criteria to improve the design and economic viability of small hydro programs, and to identify and prepare a medium term investment program to develop a series of small hydro schemes in Palakkad.

Parallel to this, IRTC was implementing a program of participatory planning at the local level in selected Panchayats. The Panchayat Resource Mapping (PRM) programme envisaged the formulation of development plans in these Panchayats based on an elaborate program of appraisal of both human and natural resources. The first phase of the program was the assessment of potential in the Panchayats with the help of local residents. Maximum people's participation was ensured by involving the local Panchayats at every stage of study. It was decided to extend the PRM program to Karimba Panchayat as well, along with the initial ones. Since Small Hydro Projects (SHP), which can be



Study report on SHPs in Kerala by IRTC and ANERT

planned and implemented at Panchayat level are a potential power source in the Kerala context, IRTC envisaged a detailed feasibility study for the Meenvalloam small hydro project which could be applied in various other Panchayats as well, where potential sites have been located. For IRTC, the project was of immense value since it could trigger the awakening in the small hydro power sector in the State, thereby bringing improvements in the power sector and rural development.

Developing a model for participatory integrated development of a rural village in the Western Ghats region through a small hydro programme.

The study titled "Developing a model for participatory integrated development of a rural village in

the Western Ghats region through a small hydro programme" was started in 1994. KSCSTE and ANERT approved the project proposal submitted by IRTC with Prof. M.K. Prasad as Principal Investigator for the feasibility study of the project. The field study was done by the team of Resy George and K.P. Prasad, coordinated by P.V. Unnikrishnan and M.K. Mathew did the regional coordination. Resy George was a civil engineer and was working with ANERT. The aim of the study was to confirm the approximate water discharge and heads available at Meenvalloam.

The Palakkad district Panchayat and the Karimba Grama Panchayat came forward to provide the necessary support and coordination. The two years long feasibility study commenced in April 1994. The first interim report of the work done during the six months up to September 30 was prepared by the project team.

The Meenvalloam waterfall in Palakkad district is located in Thuppanad river, a third order stream which is a tributary of the River Bharathapuzha. The study conducted by IRTC was also intended to give a new perspective to the Small Hydro projects compared to the various experiments done by the private and public sectors in different regions. The Meenvalloam

experiment was not only a small hydro project for IRTC but also an initiative to develop a model for small hydro power projects with minimum environmental impact. Often Small Hydro stations are conceived as standalone stations to meet local demand. Four steps are involved in this.

Since the project in consideration was construed to be connected to the State grid, the second step of demand assessment was not necessary. The results obtained from a project like Meenvallom would not only be useful for the specific site considered, but also for other similar small hydro sites, especially in the Western Ghats region. The general approach to be followed in participatory small hydro development as derived from the Meenvallom experience is given below:

There were incidents in which the fixed gauges got damaged and flowed away with the water.

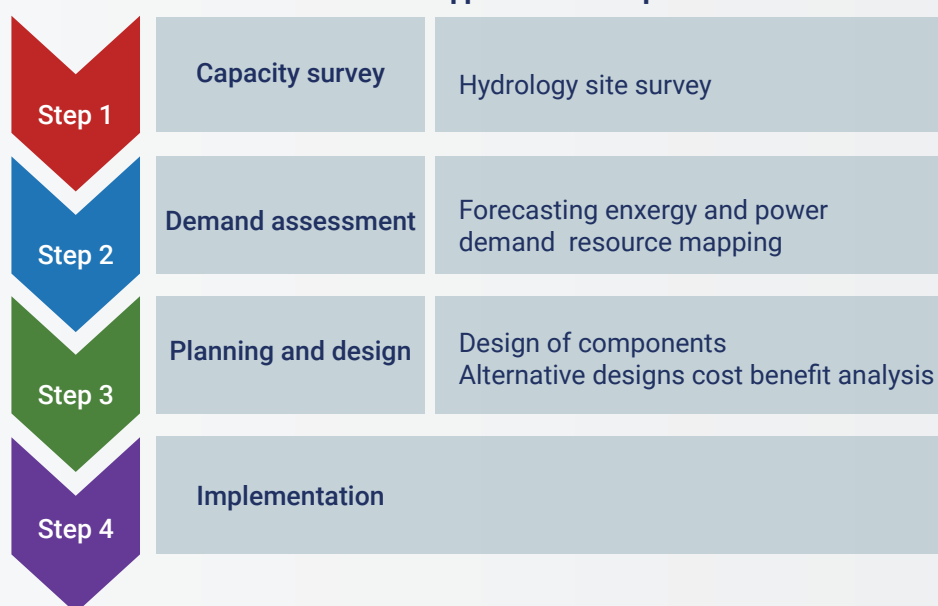
The study required the discharge values of flow for a minimum of one monsoon and two summers. And it started in April 1994 and completed in May 1996. Steam flow gauges to measure the discharge of water were fixed at the top and bottom of the waterfall. It was difficult and dangerous to reach the gauges at the top during the days of heavy rainfall. There were incidents in which the fixed gauges got damaged and flowed away with the water. Later, a correlation with the area of the lake above was calculated by noting the discharge from the

top and bottom of the waterfall. This helped in determining the discharge in the top gauge during the days of heavy rainfall. The continuous evaluation and studies of the region gave estimate data related to water flow.

IRTC also fixed a 'Class A' weather forecasting system at the top of the waterfall, which included rain gauges, evaporation pan, temperature gauges, etc. with the permission of the land owner. Experts from the Centre for Water Resources Development and Management (CWRDM), Kozhikode also offered help in recording the water flow, rainfall and other atmospheric parameters.

Hydrographs of two consecutive years were prepared by

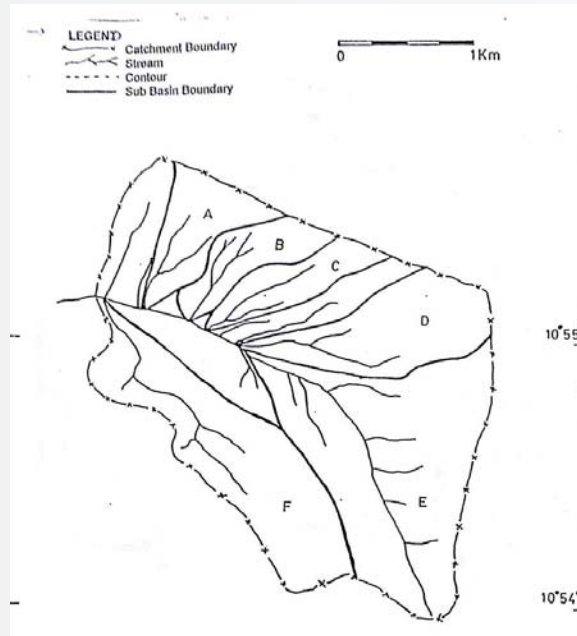
Participative Small Hydro Planning Approach And Steps



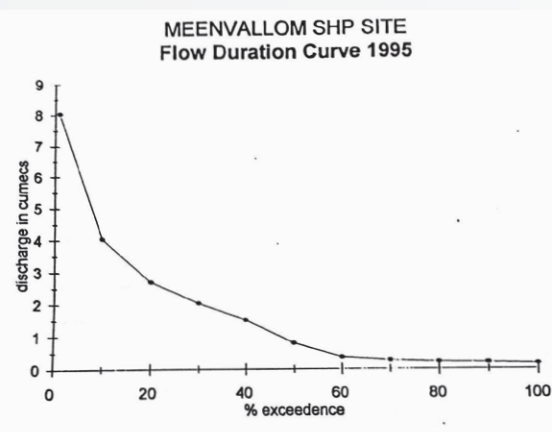
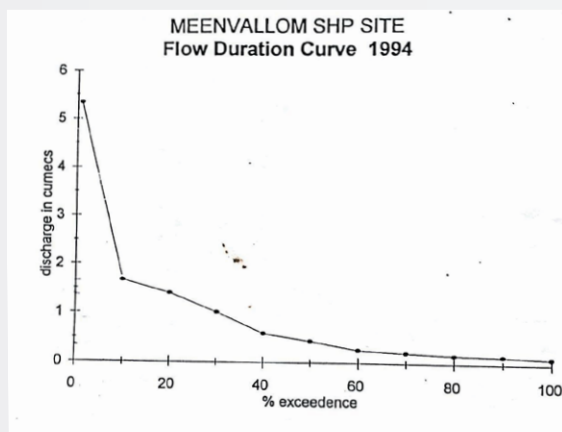
measuring the daily flow. Also, rain drop patterns of past years were analysed. All these studies showed more than average level of rainfall in the Meenvalloam Lake. The next step in the study was the earth audits. Maps of the lake and waterfall regions were prepared with the help of aerial photographs provided by National Remote Sensing Agency. The theodolite survey of the lake shores was done with the help of the civil engineering department of NSS College, Palakkad and it helped in mapping the area distribution of lake and height differences of waterfalls. The survey was done to determine the pathway for placing penstock pipes for the hydroelectric project. The geographical study of the area where dam, powerhouse and penstock pipes are to be built, was important. This detailed geographical mapping was done with the help of the Centre for Earth Science Studies, Thiruvananthapuram (now the National Centre for Earth Science Studies - NCESS). Along with studies on Meenvalloam Lake,

studies on the neighbouring forest area and lakes were also done. It was found that the system can generate 7 to 10 million units of energy per year. Two Pelton wheel turbines of 1.25 MW each were considered as the most ideal combination for the project. Experts from various institutions like Centre for Ecological Sciences based at Indian Institute of Science, Bangalore,

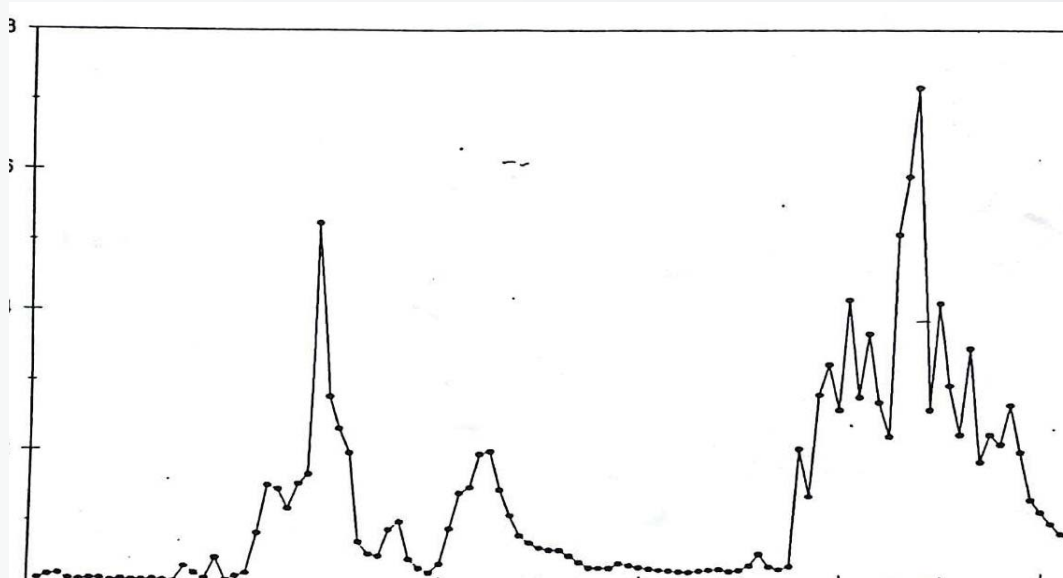
M. S. Swaminathan Research Foundation, Salim Ali Centre for Ornithology and Natural History, etc. visited Meenvalloam and suggested methods for designing the project without disturbing the environment to a destructive level. In between these studies, there were occasions such as the one in January 1995 when the entire project team lived in the forest for around ten days. The objective of the camping was to map the regions around



Sub basins in Meenvalloam catchment



Flow duration curve 1994-1995



Weekly hydrograph - Jan 1994 to Dec 1995
Image courtesy: Jaseem Hamza (Wikimedia Commons)

the lake so as to provide earth supporting constructions to avoid soil erosion and sustaining the Meenvallom waterfall. They also studied the nearby areas of Meenvallom and mapped the areas where afforestation is possible.

Based on all these studies a design of the Meenvallom project was prepared in May 1996. The basic plan was to construct a check dam at the top of the waterfall, allow the water to flow through the penstock placed on the left side of the waterfall and to place the generator below the waterfall. A project of 2 x 1.5 MW with an annual output of 8.58 MU was conceived.

The important civil engineering works required for a Small Hydel Project (SHP) is a weir,

intake structure, penstock and a powerhouse. Several cost reduction methods were explored, in civil construction. All the equipment was considered to be standardized. A weir is constructed to have a small storage to divert water from the stream to the intake. The intake structure takes water from the weir and leads it to the penstock. The penstock is a pressure pipe which carries water to the turbine. A power house is required for the purpose of housing the electro mechanical equipment. Instead of the conventional concrete and masonry dam, a cheaper gabion dam was suggested by K. Madhavan Nair, former director of Central Water Commission. Further development of the Meenvallom project design was prepared with his expertise.

The Gabion model weir arranges stones in metal nets forming a single structure. The stones needed were available at the site itself, thereby reducing cost and environmental effects. As per the suggestion of K. Madhavan Nair, a gravity dam constructed by plastering the upstream face of the weir would be a cost effective and environmentally friendly model for the check dam. While choosing the penstock also, instead of installing pipes made of cast iron, pre-fabricated penstocks made of concrete with an inner steel lining of 6mm were chosen to be installed at Meenvallom. However, these cost reduction suggestions could not be implemented in the implementation of the project.

Chapter - III

The Beginning

In 1996, IRTC prepared a detailed project report for the Meenvallom Hydro Electric Project for building a 2.5 MW power station at Meenvallom to be implemented by District Panchayat. It envisaged the following:

- Standardization
- Adequate institutional arrangement for community participation
- Multipurpose application
- Development, adaptation and application of non-conventional technologies
- Training and equipping local people to undertake the maintenance and operation of the SHP.

Standardization

More often than not, small hydro projects are undertaken in an isolated way without exploring the possibility of standardization. Each unit is designed for its specific head and discharge which is different from others. This increases the cost of manufacturing turbines and generators. One attempt in the Meenvallom project was to identify other sites which can use turbines and generators with same specifications. If several identical units can be ordered together, cost per unit can be significantly reduced. This was the reason why a 2 x 1.5 Mega Watt combination was later

chosen for Meenvallom instead of 2 x 1.25 Mega Watt configuration proposed initially.

Cost reduction

The major civil engineering costs of the project are the diversion weir, the intake structure, penstock and power house building. To reduce the cost of diversion weir, a gabion design was planned at a cost of INR 54,00,000. However, G. Madhavan Nair, who was to oversee its construction passed away. The state electricity board was also against such an experiment. Thus a conventional structure was adopted. The cost escalated several times because of





this. Similarly, cost reduction measures in penstock and powerhouse could not be implemented because the sanctioning authorities were not in agreement with the proposed measures

Community participation

The Meenvallom project is situated in the Karimba Gram Panchayat. The Panchayat was an active partner of IRTC both in field studies and during the implementation process. Another idea of community ownership of the power station was conceived jointly. For example, thousand households, each providing INR 100,000 as deposit would get in return 1000 units of electricity free of cost for the next 20 years. This plan however could not be implemented.

Multipurpose application

Besides power generation, the last stage of the waterfall which was already a minor tourist spot was identified as suitable to be developed into an active tourism centre.

Training and equipping local people to undertake the maintenance and operation of SHP

The daily running of the power station can be done by an engineering diploma holder and three technicians, all recruited from the locality. And thus the manpower cost for running the power station could be reduced considerably. The District Panchayat administration passed a resolution in its meeting held on 15.06.1996, and the District Panchayat decided to undertake the small hydropower projects for irrigation, drinking water and power generation under the Kerala Panchayat Raj Act. The change in the Electricity Act consequent to the introduction of three-tier Panchayat system had allowed District Panchayats to generate and distribute power through small hydel systems. Following the provisions of the act, the mission of Palakkad District Panchayat was to implement their democratic right to build and operate

hydroelectric projects. The District Panchayat had a track record of according priority in its development activities to water resource development and energy conservation in the district.

On 22.07.1996, a memorandum was submitted to the Chief Minister of Kerala, requesting the Government of Kerala to allot Meenvallom Small Hydro Power Project to the District Panchayat for execution. Immediately after the passing of the said resolution, IRTC prepared a Detailed Project Report (DPR) and submitted the project proposal to the District Panchayat to fetch necessary funds for implementation of the Meenvallom Small Hydro Project. As the Panchayat was privy to the previous study reports and was aware of the potential of Meenvallom SHP, the Palakkad District Panchayat decided to provide the funding for the project. However, all this happened in a very short span of time that, in one of the Panchayat local fund audits, an objection was raised regarding

the project paper, pointing out that the project was thrust upon the Panchayat by IRTC. Due to this, the proposal was again sent to the government by the District Panchayat. A meeting was held on 23.09.1996 in Thiruvananthapuram in the presence of the Minister for Electricity and Minister for Local Administration and it was decided to entrust the Palakkad District Panchayat with the execution of the Meenvallom Small Hydro Project and the Panchayat was directed to submit a Detailed Project Report to KSEB.

Formation of Palakkad small hydro company

Since the District Panchayat is not empowered to directly implement the project, it was decided to form a company named Palakkad Small Hydro Company (PSHC) for this purpose. The District Panchayat then started working on the process for company registration. A request was sent on 5.11.1996 to the Department of Local Administration for establishing a generating company for the implementation of the Meenvallom small

A power generating company was formed under a local self-government for the first time in India.

hydro project. Meanwhile, IRTC approached company secretaries and company lawyers in Ernakulam for necessary guidance. The major problem was with the formation of a company under a local self-governing body, which was a unique case in itself. National and State governments have started companies, but it was unsure whether a company promoted by a local self-government would belong to private or public sector.

Later the application was sent to the Registrar of Companies. As per Government letter No.15776/p2/96/LAD dated 20.08.1997, the state government directed the District Panchayat to form a generating company. Even though the decision of forming a company was finalized on November 1996, it took another eight months for the official approval to be sanctioned. In addition, Government of Kerala constituted an expert committee for according technical approval

to Meenvallom project vide order No. G.O. (P) 216/97/LAD dated 23.09.1997. The members of the committee were:

1. Sidharth Menon,
Chairman, KSEB
2. Director, ANERT,
Thiruvananthapuram
3. Prof. R.V.G. Menon

Immediately after the government sanction, request for allotment of forest land for implementing the project was sent to the Mannarkkad forest division. The requests were further forwarded to the conservator of forests, Forest and Wildlife Department, and to the Ministry of Environment and forests, Government of India. Since the project had no finalised finance and sponsors, these requests were not responded to. Now the wait was for the registration of the company.

In the meantime, the District Panchayat committee held on 13.01.1998 and the District Planning Committee held on 14.01.1998 included the Meenvallom Small Hydro Project



under people's participation programme. And by a resolution dated 5.03.1998 the District Panchayat authorized the District Panchayat President to represent the committee before the Registrar of companies. With the help of expert lawyers and their legal advice, the company was registered according to the Companies Act 1956 at the Registrar of companies, Ernakulam, Kerala. Thereafter the DPR prepared by IRTC for the Meenvalloom Project was officially accepted by the Palakkad District Panchayat for its implementation through their public limited company, the Palakkad Small Hydro Company (PSHC).

IRTC agreed to be the technical consultant of the project and

signed the Memorandum of Understanding with a payment of four per cent of the project fund after the completion of works. Further works were done with the coordination of Palakkad District Panchayat and IRTC and a proposal was sent to KSEB for formally allotting the Meenvalloom power generation project to the Panchayat.

KSEB forwarded and recommended the request of District Panchayat on 27.02.1998 to Government of Kerala for sanctioning the project implementation by district Panchayat. Considering the proposal of District Panchayat and recommendation from KSEB, Government of Kerala allotted Meenvalloom small hydro project

with an installed capacity of 2.4 MW (later changed to 3 MW) and an annual generating capacity of 10.6 million units to the Palakkad District Panchayat on 22.04.1998 and directed the Panchayat to commence the project within one year. KSEB also accorded sanction to allot the Meenvalloom Small Hydro Project to the District Panchayat, Palakkad for execution on 30.06.1998. It was also decided that KSEB would purchase the electricity generated from the project. Further revised and refined, detailed reports on the project were prepared by IRTC and the same was approved by the DPC and forwarded to the District Level Expert Committee (DLEC) and they assured full support for the project. District Panchayat requested the State Government to provide necessary special arrangements to accord technical sanction to the DPR of MSHP since the DLEC cannot issue Technical Sanction for a project like MSHP having a capital investment of INR. 10 Crores, the government vide letter No. G.O. (Rt) 3026/98/LAD dated 16.10.1998 asked the already appointed technical committee to examine and issue Technical sanction to the proposed project. But the sanction process again took a time period of two years, which further delayed the implementation of the project. The Palakkad Small Hydro Company Limited was incorporated under the Companies Act, 1956 on 20.01.1999 with Company number 09-12749. The Certificate



of commencement of business on 30.03.1999 was issued by The Registrar of Companies, Kerala. Later a board of directors for the company was formed. Engineers from KSEB, Experts from IRTC, the District Panchayat president, vice president, and Panchayat members constituted it.

Six of the directors signed form No.29 as per companies act 1956 pursuant to section 264 (2) of the act

- K. V. Vijayadas (President, District Panchayat, Palakkad)
- K. V. Ramakrishnan (Vice President, District Panchayat, Palakkad)
- E. P. Sankaran (Chairman, Standing Committee on Finance & Planning)
- P. Mammikutty (Chairman, Standing Committee on Welfare)
- P. Balachandran (Chairman, Standing Committee, Public Works)
- Dr. R.V.G. Menon (Former Director, IRTC)

They were accepted as the first board of director team vide resolution dated 07.01.1999 and were also mentioned in the Articles of Association vide cl.93a. The terms and conditions of the directors are enumerated in the Articles from cl.93 to 198. Further an amendment to the Articles was incorporated as cl.93b for facilitating Government of Kerala to nominate a Director on the Board of the Company from time to time. The main objective in the Memorandum and Articles of Association of the company were as follows:

Raising adequate funds turned out to be a bigger challenge due to lack of technical and administrative clearance.

1. To generate, transmit, distribute, buy, sell and supply electricity and produce electricity from natural and other sources.

2. To carry out business as a generating company/ licensee/ sanction holder under the Indian Electricity Act 1910 and/or Electricity (supply) Act 1948.

The technical support for the project was officially offered by IRTC, and hence started working on the project as per the DPR already prepared. Experts from engineering and other fields were appointed in the team for this purpose. Now the only issue facing the project was whether the company had the land, finance and government sanctions for the project, since in most cases land availability was one of the important bottlenecks.

Immediately after registration of the company, requests were again sent on 19.02.1999 to the Ministry of Environment and Forests for the diversion of 1.15 Ha of land. On 26.02.1999 the ministry replied to the request and forwarded it to the Government of Kerala with a direction to revise and inspect the proposal for allotting the forest land. After several discussions the proposal was sanctioned by the Government of India but it was pointed out that the agreements

would be made only with the financial closures and the government sanctions. The next hurdle was to arrange funds to the tune of an estimated INR 10 crores for the company.

Equity funding

The search for project funding was initiated by the IRTC on behalf of PSHC and applications for loans were sent to several governmental and non-governmental organizations. Power Finance Corporation agreed to give up to 50 per cent of the total expected implementation cost and IREDA agreed to provide the remaining 50 per cent of the project cost. But the agreements were not made since the technical sanction and the forest clearance were not finalized. The Panchayat was ready to contribute their funds as the capital investment for the company.

In accordance with the memorandum of association, the District Panchayat became the main shareholder. That is, 51 per cent of the equity capital of the company was to be contributed by Palakkad District Panchayat. A part of the funds of the Panchayat were decided to be utilized for this.

The District Panchayat allotted INR 81 lakhs towards share capital contribution in the company from the plan fund during the year 1998-99. And during 1999-2000 the District Panchayat passed an amount of INR 1, 02, 87,548 towards

the equity share capital of the company. Even though the amounts were sanctioned the Panchayat did not have the right to pass on the amount without sanction from the State Government.

In accordance with the decision of the District Planning Committee (DPC) and District Panchayat Council, the District Panchayat vide letter No. G-176/96 dated 15.06.1999 requested the Government to accord sanction for the contribution of the above amount. The requests were not answered because of the lack of technical sanction and clearance of agreements.

At the same time, the company was struggling to procure the 1.15 Ha of land, but these attempts also met with hurdles. In case of the forest department, they were unsure about the project and were not ready for the diversion of land. Ministry of Environment and Forests Regional office, Bangalore allowed the sanctioning of land on September 9, 1999. But the handing over of the land was did not happen. On one hand the loan from banks were blocked because of the lack of forest clearances and on the other hand the forest department was asking for the financial closure and the agreements with KSEB in order to hand over the land.

At the same time IRTC entered into talks with the government asking for permission to Block and Gram Panchayats to buy shares of the company so as

to build more capital fund. Arranging more capital fund could be of help in starting the implementation works in case the loans from external sources were delayed. The Local Administration Department vide order No. 1527/00/LAD dated 1.04.2000 sanctioned all Gram Panchayats and Block Panchayats to take shares in Palakkad Small Hydro Company Limited. Initially the local governments did not show interest in taking the shares, three or four Panchayats eventually came forward to buy shares of the company.

The Local Self Government Department of Government of Kerala vide order No. G. O. (Rt)No.2635/10/LSGD dated 10.08.2001 approved the action taken by the District Panchayat, Palakkad for forming the Palakkad Small Hydro Company Limited. It also approved accumulating share capitals of INR. 81 Lakhs during 1998-99, and INR. 1, 02, 87,548 during 1999-2000 for the company.

Now, since the capital was being arranged by the Panchayat, the company kept trying to get the necessary land procured since the forest department had to be compensated for the land allotted by them. As per existing law, land is to be cleared for use by forest department before handing it over to the company. The company requested the forest department to take necessary actions to hand over the land as fast as possible vide letter No. PSHC/99 dated 12.07.2001. Actions were

taken based on the request. The divisional forest officer invited tenders for the trees to be cut, but no tenders were received.

The technical committee formed on 16.10.1998 by the government of Kerala for allowing technical sanction approved and accorded sanction to the project on 25.02.2000. Soon after receiving the technical sanction, the company approached the Forest and Wildlife division requesting for the agreement and they agreed to execute the lease agreement.

The Ministry of Environment and Wildlife also approved the diversion of 1.15 Ha of land and instructed Forest and Wildlife division to take appropriate actions through a letter dated 21.8.2000. Consecutively the company wrote a letter to the Conservator of forests, Bangalore on 23.11.2000 asking for handing over the land for laying the 11 KV lines to the project site. On 27.12.2000 itself the approval was obtained from the deputy conservator of forests, sanctioning the diversion of forest land for the Meenvallom Small Hydro Project. The sanction for the land required for powerhouse for a period of 25 years was also obtained from the State Government on 27.01.2001.

When the agreements with the forest department and the capital fund collection came out positive, the company started working on the project. Considerable work in the areas of engineering and management had to be covered. Mechanical, Electrical, and Civil works had also to be started.

Chapter - IV

Initial strides

Formation of the project team

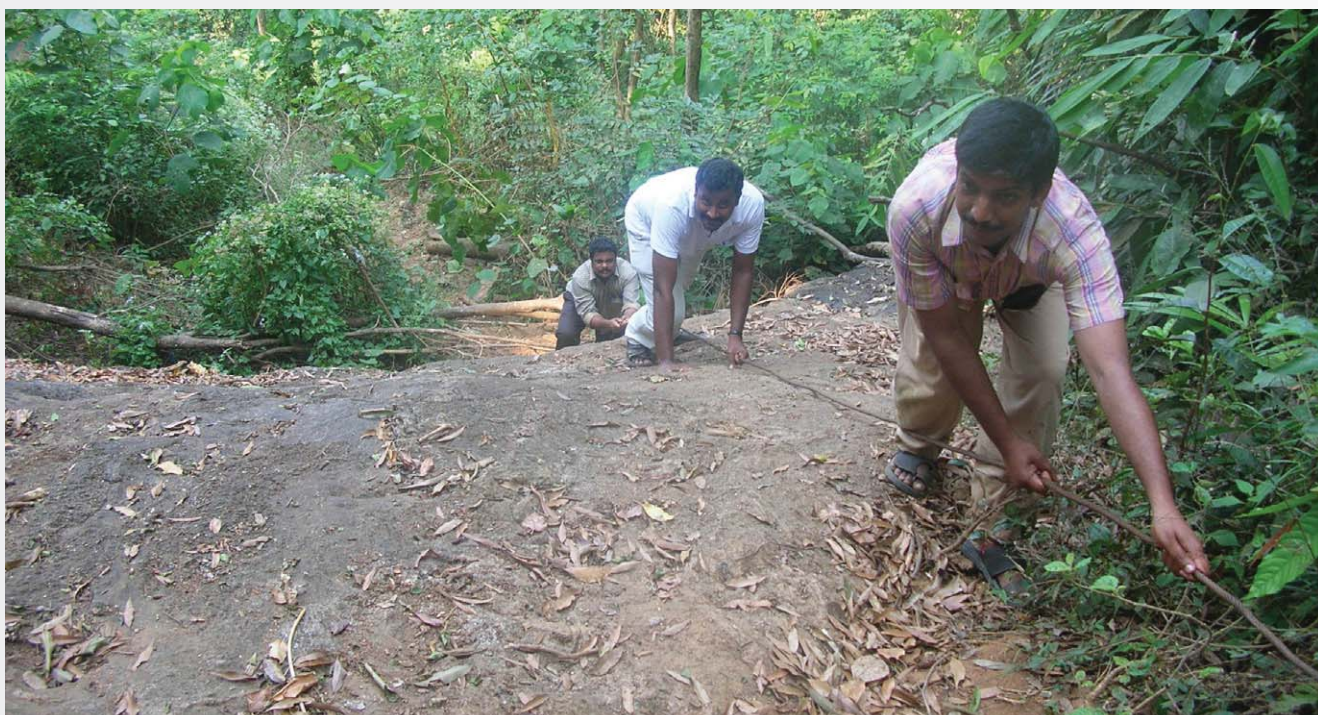
The initial proposal was to construct a small hydro project in the Thuppanad puzha at Meenvallom, located in Karimba Grama Panchayat in Mannarkkad Taluk, Palakkad District, with an installed capacity of 3 MW, so as to generate about 8.37 million units of electricity annually, which shall be fed into the KSEB grid. A project of such a scale cannot be executed based on a report prepared by the project team alone, but requires revised and refined study reports by experienced project executives

and experts. The board of directors discussed the issues and decided to collaborate with Steel Industries Limited, Kerala (SILK) for the execution of the work. SILK had a history of coordination with different projects even with the Palakkad District Panchayat.

Soon after the formation of the company, PSHC started negotiations with SILK for executing the Meenvallom project on a turnkey basis. After some discussions it was decided to delegate the project to SILK on

contract turnkey basis as they were assessed to be capable of its execution.

Thus, by March 2000, SILK was quoted for the Meenvallom Project as a turnkey contractor without inviting competitive bids for supply of equipment for SHP. SILK also agreed to do the civil works on the basis of a formula of actual expenditure and 15 per cent administrative charges. The Palakkad District Panchayat and SILK together with IRTC had thus embarked on this project, almost as a joint effort.



Procuring penstocks and other equipment

In the meantime, IRTC and PSHC had been looking for the availability of suitable turbines, generators and penstock for the project. IRTC came across an advertisement for sale of good quality 90 cm pipes at very low rates by Steel Authority of India Limited (SAIL). The pipes were found to be of the exact length needed for penstocks of the project. Also M/s Jyothi Baroda Ltd, Vadodara, a group experienced in making small hydro project equipment gave an attractive offer of two 1.5 MW turbine-generator set for an amount of 1.5 crores. Since the offer was attractive, IRTC suggested PSHC to purchase them straight away using the available plan funds. The director board decided to buy the pipes and equipment utilizing the capital of the company. As per orders, SILK went ahead with the procurement of the equipment; though the financial closure had not been achieved. SILK also placed orders for two turbines with M/s Simplex Ltd, Bhilai and

the equipment were ready for dispatch in 2001. PSHC was also paying those advances within the limit of their resources.

The pipes and equipment bought by May 2000 were moved to a storehouse at Kalladikode by SILK on behalf of PSHC. Along with the electrical works SILK agreed to prepare the layout plans also, since SILK had electrical and civil engineering divisions. The funding to SILK for this purpose was decided to be provided by the District Panchayat and IRTC would coordinate and provide necessary technical assistance. They formed a team including Executive Engineers and Assistant Engineers to execute the project and this team would coordinate the activities till the end of the project.

The price quoted by SILK for electro-mechanical equipment was INR. 4.45 crores that was reasonable per megawatt basis. PSHC paid an advance of INR 96,00,000 (Ninety six lakhs only) out of the one crore raised as equity, at that point.

Regardless of the difficulties faced in obtaining government sanctions, IRTC mainly focused on implementation of the project. Meenvallom was a project of great importance for IRTC at that time. IRTC made calculations regarding the expenses and the technical requirements while forming the team and this helped a lot in sustaining the team even when the implementation work was not going on.

Arrangement of Funds and Power Purchase Agreement

The company asked SILK to refine the detailed project report as per site requirements for implementation. The civil engineering works were also entrusted with SILK. Even though IRTC prepared several reports and a DPR, they were not comprehensive enough to be considered for actual implementation. Hence the report prepared by the engineers of SILK was taken as the official DPR and the entire work was carried out by a technical team of IRTC. The company was still in search of funds for the project. It had



applied for financial support from the small hydro project funds of Indian Renewable Energy Development Agency (IREDA) and other government schemes, expecting loans to support the project. However, the agreements were not being executed due to one or other reason. The major reason for not getting funds from government was that according to existing rules the DPR is only to be prepared after procuring funds. But the Meenvalloam project had already completed the initial stages and was looking forward to the implementation of the project. Thus, the existing rules rendered the project ineligible for funds. Another idea that came up for getting funds was bank loans. But this option was ruled out because of lack of government or other securities.

Meanwhile the government policies also changed. The new policies were not in favour of power generation by local self-governments. It was a time when the government had incurred a lot of liabilities for small and large companies which were not running profitably. This created a financial burden on the government which gave an impetus to the new policy to close down the public sector companies or to privatise them.

The power purchase agreement (PPA) was another factor which caused the denial of loans by banks. The Government of Kerala through KSEB had agreed to purchase the power generated from the Meenvalloam project

in the year 1998 itself. But no agreements were executed between the company and KSEB. A power purchase agreement which details the tariff and the time period of the agreement is required for availing loan for a power generation project. The Palakkad Small Hydro Company vide letter no. PSH- C/G/2000 dated 29.11.2000 requested the government to allow KSEB to buy the electricity produced, but the new policies formed were not favourable for public sector enterprises. Thereafter, a series of letters were sent to the government to take necessary actions for providing the Power Purchase Agreement. It was later in 2002, vide order No. G.O. (MS)/14/pd dated 06.06.2002 that the government approved the draft agreement which was prepared with the support of KSEB to be executed between KSEB and the Palakkad Small Hydro Company Limited. Immediately after approval of the draft agreement, the company wrote to the Divisional Forest Officer, Mannarkkad to hand over the land but the response was not favourable.

The project team revised the project plans and based on the technical comments of the team, PSHC made changes in its design parameters and further increased the installed capacity of the project from 2.4 MW to 3 MW. Considering these changes, the state government modified their earlier order vide G.O.(MS) NO.21/2002/PD dated 02.09.2002 fixing the installed capacity to 3 MW instead of 2.4 MW specifying the tariff for the first five years from the date of commercial operation as INR 2.50 per unit and thereafter INR 2.12 per unit for the following 20 years.

In addition to giving sanction, the government made a statement in the draft PPA that "No government guarantee will be given to the project" in contravention to the earlier understanding. The challenge before the company now was to avail bank loans at its own risk. Banks, however, were not ready to give away loans in such a scenario where the company did not have any stable income to repay the loan. They raised questions regarding the assets of the company. This



happened to be a time when the company operations were in a stalemate. Since the government declined the guarantee, there were no provisions for loans and the department of forest was reluctant to hand over the land. At this juncture the only member in the company was a secretary who was working part-time, without any full-time staff appointed. The director board members were also honorary, and had no income. Hence, a basic criterion for sanctioning loans to the company was not satisfied. There were possibilities for funds from the private sector, including international loans, but IRTC and PSHC was not ready to choose that route.

Environmental Clearance

There was some progress in land acquisition for the project after the registration of the company. IRTC conducted calculations regarding the land requirements based on the DPR and the requirement were found to be 1.15 hectares. However, it was realised later that, such ideal

It was decided that instead of the usual method of cutting down all the trees in the project area, only those trees where the land is used need to be cut.

spatial planning is impractical due to various reasons. It was decided initially that instead of the usual method of cutting down all the trees in the project area, only those trees where the land is used need to be cut. It was also decided to buy the land, including the trees with an intention of protecting them. The idea of minimum usage of land for the project was also mooted.

Land Requirement Calculation

Road access was required to the powerhouse to bring the equipment and there existed only a foot trail on the far side of the river. In order for trucks to transit, around 7 feet wide roads are required. A small access to the uphill section through an estate, a 3-feet wide path through the edge of the hill to the dam, etc. was the some other requirements in the forest land. Adding up to

all these, a requirement of 1.15 hectares was finalized. This decision was unwise, as proven by later experiences. It would not make much of a difference in the administrative processes if the area was more than this. The processes - and hurdles - in getting land sanctioned would be same in any case. The problem of actual requirements tending to overshoot the initial estimates happened here also, with the addition that any usage of forest land beyond the sanctioned area would attract penal action for forest law violation. A provision for such exigencies in land requirement should have been made while calculating forest land requirement, which was not done here. Cutting only the unwanted trees in the area also proved to be almost impossible. The forest department would not hand over the land directly, but would calculate the value of the trees in the plot as well. Either the buyer should pay the price of trees or department would auction the trees and would hand over the land after cutting the trees. These facts were learned while getting the land sanctioned.

The Chief Conservator of Forests and the department of forest were very helpful in resolving some of the mistakes made. This helped in forwarding the proposal to the central government. The land needed for the project was under the Bangalore office and a conservative officer visited the project site for inspection. After inspection the department of forest was convinced by the idea





of small hydro projects. After an affirmative proposal given by the department of forest on 30.9.1999, the government as per order No. G.O. (Rt)No.128/00/F&WLD dated 23.03.2000 and a modified order No. G. O. (Rt)No.30/01/F&WLD dated 27.01.2001 accorded sanction for diversion of 1.15 ha of forest land for the construction of the Meenvallo Small Hydel Project in Thuppanad falls. But since the financial provisions were not confirmed the department was helpless to hand over the land even after the formal sanction of the land for the project. Cutting of trees was also not possible due to lack of financial closure. Neither a government guarantee nor loans were available from non-private sources.

At this juncture, the company again wrote to the conservator of forests, Olavakkode requesting permission for starting the civil engineering works. District Panchayat also requested on

28.04.2003 the Forest and Wildlife department to take necessary actions so that the works could be started using the available share capital. The Principal Secretary of Forests and Wildlife, in a communication on 30.10.2003, addressed to the chief conservator of forests, Thiruvananthapuram directed to take immediate action for handing over the land to the company. Several series of communications were exchanged between PSHC, Ministry of Forest and Sports, Conservator of Forests, Thiruvananthapuram and the Forest and Wildlife Division until new policies in favour of small hydro projects were introduced.

Discussions were done between DFO, Mannarkkad and the company directors on 08.12.2003. Central government and state government had sanctioned the land for the Meenvallo Small Hydro project, but no provisions were made to hand over the

land without financial closure and power purchase agreement. It was informed by the forest officials that a decision on cutting of trees will be taken after submitting specific proposals for mobilizing funds for the project. At this juncture, PSHC was in search for funding agencies and it approached several organizations such as a Kerala Power Finance Corporation (KPFC), Indian Renewable Energy Development Agency (IREDA), etc. Several applications were sent and most of the agencies replied positively but the loans were not sanctioned due to lack of counter guarantees. An application for financial assistance was also submitted to NABARD in 2005. However the forest department insisted that PSHC should get financial closure for handing over the land. This deadlock went on for some time. These hurdles cost PSHC a minimum of 6 valuable years. A change of Government in the state changed the scenario.

Chapter - V

Overcoming Initial Hurdles

Change of Government Policies and National Board of Agriculture and Rural Development (NABARD) Assistance

The project was mired in a state of uncertainty because of lack of resources in order to move forward. This state continued till 2006. In May 2006, a new LDF government came to power in Kerala. Dr. Thomas Isaac, the new finance minister came forward to help PSHC to resume its operation. It was the decision of the previous government not to give a guarantee that delayed the project for at least five years.

The new government was aware that the project was of immense importance to the community and to the State. The government suggested NABARD, which provides financial assistance to local governments at low interest rates and has schemes related to local development. The idea was to provide a loan to Palakkad district panchayat and the company would repay the loan through the panchayat. NABARD offered the loan at low interest rates compared to those by IREDA and other financing agencies. The Finance Minister wrote to the

NABARD recommending sanction of the loan on 07.07.2006 and requested KSEB to revise the approval of draft Power Purchase Agreement(PPA) for the further functioning of the project. NABARD was then ready to sanction the loan with proper documents of PPA and project details.

The proposal was revised by NABARD and an expert team visited and inspected the site. There were many queries raised on topics such as viability and environmental impact and the company with the help of IRTC





was able to answer all of them satisfactorily.

The Power Purchase Agreement was signed on 23.01.2007 by Chief Engineer, Corporate Planning for KSEB and the Chairperson for Palakkad Small Hydro Company Ltd (pursuant to a resolution of its Board of Directors on 27.12.2006) without which NABARD could not release the funds. The PPA was then forwarded to NABARD on 24.1.2007. NABARD authorities of the regional office at Thiruvananthapuram forwarded the loan application to the head office in Mumbai. Finally, a loan amount of INR 779.32 Lakhs was sanctioned on 28.03.2007 under the Rural Infrastructure Development Fund and a start-up advance of INR 1,55,86,000 was released through the Government of Kerala vide letter No. G. O. (MS) No.233/2007/LSGD dated 10/10/2007. The agreement with NABARD was that the repayment of the loan would commence from

As per the requirements, engineers and other staff were recruited by the end of 2007.

the second month of starting commercial production from the project or first anniversary of disbursement of the last installment of the loan, whichever occurs earlier (vide LSGD order No. G. O. (MS) No.233/2007/LSGD, Thiruvananthapuram dated 10.10.2007).

Adding to this, the Palakkad District Panchayat through the Palakkad Small Hydro Company (PSHC) spent an amount of INR 72,73,000 during the period from 01.04.2009 to 30.04.2010 and INR 53,22,693 from 01.05.2010 to 31.08.2010. As per the PPA, the tariff period was reckoned as 25 years at a rate of INR 2.50 per unit for the first five years from the date of commercial operations and INR 2.12 per unit for the following 20 years.

The company also requested Kerala State Electricity Regulatory Commission (KSERC) to revise the rate of electricity generated from Meenvalloom. A petition was filed to KSERC by PSHC for the review and modifications of the PPA for revising the tariff from INR 2.50 to INR 4.88. A tariff of INR 4.88/kWh (for less than 5 MW) and INR 4.16/ kWh (for projects between 5 MW and 25 MW) was notified by KSERC for small hydro power plants. These tariffs, however, did not consider the capital cost towards installing the transmission line to the nearest substation, although SHP policy makes this obligatory for the project proponent.

Another issue faced during the approval of funding was that the bank had to perform an inspection of the company. But there were no permanent staff or chief engineer with PSHC at that time. The company was still working with a nominal staff, a company secretary and administrative staff and no



technical staff. NABARD also raised this issue. Thus, by the end of 2007, engineers and other staff were recruited by the company.

Protests

Immediately after the sanctioning of loan on 30.03.2007, Palakkad Small Hydro Company approached the Department of Forest for further proceedings. A request to hand over the requisite land was sent on 09.04.2007, mentioning the details of the sanctioned loan. Soon afterwards on 15.05.2007, the Chief Conservator of Forests, Thiruvananthapuram sanctioned the removal of trees and asked the Eastern circle forest officer to take necessary actions for the same. At the same time, the District Panchayat also requested Divisional Forest Office, Olavakkode in writing to remove the trees.

Since the procuring of land was the only task left to start the work, IRTC started the required road protection works. The local residents also got benefited

from the road built by the district panchayat from Moonnekkar to Meenvalom. The road sides were protected using pebbles to avoid soil erosion after the removal of trees. All these works were done under the supervision of PSHC and IRTC.

Before handing over land to the company, DFO had to cut and remove the trees and the only way for this was to call for tenders. The demarcation of trees started on 13.06.2007. But the completion of demarcation got delayed.

On the one side, the residents and the whole district were going to get benefited from the small hydro project, but on the other side there were arguments against the project as well. A written petition was filed by Bharathapuzha Samrakshana Samithi on 22.06.2007 against the Meenvalom small hydro project. Later on 19.09.2007 a written complaint was again written to the concerned Minister by the same Bharathapuzha Samrakshana Samithi. They

argued that Meenvalom project would adversely affect the river Bharathapuzha and the agriculture in its inundation area since the Thuppanad River is a tributary of Bharathapuzha. This was a flippant complaint because the project would not alter the flow of the river downstream, not to speak of Bharathapuzha. Several meetings and discussions were conducted to convince them that neither the water is diverted nor polluted since the water after power generation is left back to the Thuppanad river without much storage. These proved to be futile and a case was filed in the High Court. The President, District Panchayat was the first accused and Director, IRTC the second. Adv. Sivan Madathil, an environmentalist agreed to help with the case in view of the good intentions of the project. The case in high court lasted for a few months until the petition was disposed of based on the interim order passed on 29.05.2008 and the court finally dismissed the PIL on 09.07.2008.

Chapter - VI

Moving Ahead

The Second Phase

The demarcation of trees was completed and the paper works regarding the handing over of land was not yet over. The DFO asked the company to remit the Net Present Value of trees since the tree cutting was delayed from the year 2000. The company approached the DFO and a meeting was held on 30.07.2007 and the company decided to buy the trees since calling for tenders again would only delay the process of cutting of trees and procuring of land. The work had to be started soon and an amount

of INR six lakhs was remitted to the department of forest on 12.03.2008. After remitting the amount, the District Panchayat again requested the department to remove the trees as fast as possible so that the work could be started. The tender notice was issued by the divisional forest officer on 02.02.2008 and was given on 25.04.2008.

Now the cutting of trees was started again, but this was delayed due to rain and the works were extended by another 8 months. Also, it was difficult to transport large trees through

the muddy road. The trees were cut and again machined to small pieces to transport them out of the forest. Later the land lease agreement for 25 years between the forest department and PSHC was signed on 23.06.2009. After a long wait, the land was transferred to the company on 18.09.2009 to start the implementation works.

In the meantime SILK had procured the penstock pipes and other equipment required for the project. When everything related to the project came on to the right track in March 2009,





the company asked SILK to start the civil works. SILK replied that they were short funds and asked the company to advance some funds. The company asked SILK for a statement of expenditure. They presented a total bill for INR 2.4 Crores. However, it was found that the actual cost of the equipment was far less than what was quoted. The actual purchase bills showed the cost of the turbine and generator together as only 1.24 crores and the amount was paid in 2002. SILK had billed the company INR 2.4 crores for the same equipment claiming their present cost. The company could not accept this demand. The Company had already paid SILK an amount agreed upon as the cost of the equipment, and these could not be escalated post purchase. It was assumed that SILK has distributed the whole profit margin for the entire equipment to these two items alone, to which PSHC had no objection provided SILK

was willing to supply the entire equipment at their original price. However, that was not the case and SILK was demanding higher price for equipment already purchased and revised prices for the remaining equipment. Having made use of the money paid by the company for other purposes, SILK did not have enough funds to start the civil works. This situation caused another stalemate.

The issue was taken to the office of the Chief Minister when several rounds of direct negotiations got failed. After another set of negotiations and the intervention of chief minister it was decided to terminate the agreement with SILK. The contract with SILK for civil and electro-mechanical works was terminated on 17.08.2009.

The forest land had been handed over to PSHC on 08.09.2009 as mentioned earlier and the civil works had to be started soon. After termination of the earlier civil work agreement with SILK,

IRTC agreed to be entrusted with the civil works consultancy. Tenders were called for civil works on 20.12.2009 and from the 3 quotations received the lowest bidder was M/s Steel Industrials Kerala Ltd and PSHC awarded the work to SILK. Another agreement was executed between PSHC and SILK with the help of M/s Saravana Civil consultancy for the project.

During the discussion conducted in February 2010 at the chamber of the President of the Palakkad District Panchayat, the managing director of SILK agreed to the suggestions as far as the turbine and the subsequent equipment were concerned but insisted on the earlier price of the generator. However, after a new director board took charge in SILK, there was another meeting between PSHC, IRTC and SILK on 27.3.2010 and it was decided to entrust all the electro- mechanical works to SILK with a profit margin of 10 per cent over and above the original supplier's invoice value.

Chapter - VII

In Full Swing

Implementation Phase

The civil works were officially started on 9th March, 2010 and was inaugurated by the Minister for Local Self Government in the presence of the Minister for Electricity. In this second stage, minor changes had to be made in the layout as per the suggestions of the consultant. The E. C. Padmarajan, Chief Engineer also had a commendable contribution in the works done at Meenvalloom. Overall erection was supervised by Padmarajan from PSHC and E. P. Radhagopi from IRTC. The public road from Moonekkar to

Meenvalloom was built earlier by the Panchayat. A temporary road to the powerhouse was built using 2.03 Ha land.

As per the design a small weir had to be made above the stream in 0.09 Ha using plum concrete methods and the penstocks were to be placed. But the construction of the weir was held up because the pathway to the proposed site of the weir was blocked by the owner of the land. After several negotiations the land was taken for lease for a time period of 6 months. The pathway for penstock was identified and

marked for clearing the forest. The rocks in the area and removal of large trusses also delayed the work. Work had to be paused during unexpected rainfalls as well.

The total length of penstock required was 200 m and the penstocks were of 6 m length which was unable to be transported uphill as such. The penstocks were cut into 3 m pieces and then transported uphill. The penstocks were then welded and placed in position using ropeways. No fixed cranes were used at the time of



construction to reduce costs. The power house was a building designed with minimal area and required only 1.12 ha. The presence of hard rocks in the area presented challenges at various stages of the work. Rock blasting in some regions was done for easy removal of rocks. Excavation works were also needed during certain stages.

In the meantime, there was another development. A vigilance case was filed against the company and IRTC on 28.7.2011 regarding the rock explosion during construction of the powerhouse. The court ordered to stop the works until this issue is fixed. Earth excavation works were done in both the weir site and the site of powerhouse to build a stable base. The case was filed regarding these works. The allegations were found to be baseless. The company won the case, but it took another six months to get settled and the works resumed in January 2012.

The powerhouse consists of a turbo generator and a control room. The turbo generator set was installed in place by 2013. Transportation of the heavy equipment was the hardest part. The equipment was finally installed and the electrical works in the power house were completed by the end of 2013. Two 2000 KVA and one 100 KVA transformer manufactured by Indo-Tech, Chennai were also placed after inspection by IRTC and PSHC engineers. The generators were sent for overhauling at Bangalore and nine penstock bends were also fabricated as per design.

Some delay occurred with the completion of the work of the powerhouse and weir due to heavy rain in the rainy season and the non-availability of explosives at times.

The Final Phases

The Meenvallom project had faced almost all the hurdles usually faced by large hydel projects - including the cases filed and environment-related objections. The residents had the benefit of having road connectivity to the area and they supported the project. They also had requested for a footbridge to cross the stream on the way to the power house and the Panchayat promised to work on the same. The powerhouse was built in a very restricted space using an area of 0.125 ha and the weir was of a minimal storage type with an area of 911 sq. m. Due to the time lag of 10 years, the equipment had to be thoroughly overhauled and part of the penstocks had to be replaced. Even then the overall cost was less than the current cost estimates. The total project cost which was estimated at 10 crores reached 21 crores on completion in 2014 due to natural escalation of costs of materials

and labour cost. The generators were synchronized with the KSEB grid on 16.07.2014. The formal inauguration of the project was done by the Minister for Electricity of Kerala, Aryadan Mohammed on 29.08.2014.

Currently the power generated from the plant is sold to the KSEB at a rate of INR 4.88 per unit. The initial tariff specified in the agreement was INR. 2.50 per unit, which was increased to INR. 5.25 per unit as on the date of commission of the project. Efforts have been taken to increase the tariff to this rate.

The power generated at 3.3 KV is stepped up to 11 KV and is connected to the KSEB grid at Kalladikode substation. Along with power generation, the tourist attraction of the waterfall is also preserved.

Initially, it was planned that during summer the entire inflow would be held at the reservoir and released to the station for a period of two or three hours to generate full power of 3 MW to supply the peak load. However, this would have hampered the tourist attraction at the Meenvallom site. Hence the operation schedule was revised so as to ensure that the aesthetics of the waterfall is not disturbed.



Chapter - VIII

Unforeseen Losses and Valuable Lessons

Unforeseen and Avoidable Losses

The total time taken from the commencement of earth work of dams to beginning of commercial production took three and half years (42 months). During this period, five months were lost due to litigations and three monsoon seasons had passed by wherein works had to be paused because of heavy rainfall. Thus the actual construction time can be calculated as approximately 28 months. The work could have been completed in 2004 which could have lowered the cost tables and project costs.

The energy that could have been produced during the delayed period would count above 7 crore units and electricity costing at least INR 20 crores could have been produced if the works were completed without the administrative and other delays.

Lessons Learned

The project was initiated in 1996 by the then Left Democratic Front government, but was later held up due to delay in the allotment of 1.15 hectares of forest land on 25-year lease and sanction of loan for project funds. Now the Meenvalloom project envisages generating 87.5 lakh units of

power a year.

Almost all hydroelectric projects and irrigation projects have had time and cost overruns, like the Kallada Irrigation Project, which had 3 years of time overrun and 10 to 15 times of cost overrun. One of the objectives of taking up the Meenvalloom project was to demonstrate how such overruns can be avoided. Ironically, instead of 2 years it took 12 years to complete and instead of 7 crores the cost got escalated to 21 crores. The project served as a direct experience of how such overruns happen. The major reasons are





administrative bottlenecks and financial hurdles created by non-conducive administrative rules. The major administrative bottlenecks were delayed governmental decisions, delays in environmental approvals, changes in financial policies, etc. Financial bottlenecks arose due to these changes in government policies. The financial approvals which could have been granted in weeks got delayed because of the change in policy regarding government guarantees. The actual construction could have started in 2000 and got finished in 2002 in which case the cost would not have exceeded 7 crores. During the 12 years of delay the power station could have produced some 10 crore units of energy valued above INR 30 crores. Within three years the entire capital could have been recovered.

It was learned from the entire experience that for future endeavours, it is to be ensured that all required administrative

The environmental impact is minimal since the project is a run-of-the-river scheme, with no long term storage at all.

and environmental sanctions are acquired in advance. A single window system for this purpose should be set up by the government. The financial resources required can be collected in advance from the consumers by offering them an attractive tariff. Consumers around the project area can be approached to invest in the project for electricity that will be supplied to them over a course of a few years. Thus a small hydro project can be totally financed by consumers. This requires permissive sanctions from the government. All small hydro projects of the future can be financed this way.

The basic design of small hydro projects can be different from that of large ones and these can be much simpler, rather than trying to emulate one-size-fits-all

models. Instead of scaling-down the different components of a large model, local conditions and requirements can be taken into consideration while deciding the components of the project. However, in Meenvalom no such simplification was made. And hence the final cost per MW came to INR 7 crores, which is comparable to large stations. This could be made much lesser with simplifications and a better design based on parameters such as available head, stream flow, capacity, and demand side. Building a small hydro project helps creating a more diversified electricity system providing power production in smaller distribution systems even when the main grid is disrupted.

Since its commissioning in 2014 till November 2017, the Meenvalom SHP had sold 2.21 crore units of electricity to the KSEB earning revenue of Rs. 10 crores. The fact remains that this project could have been commissioned at least 10

Sl. No.	Name of the scheme	Basin	Installed Capacity (MW)	Annual energy generation (MU)	Status
1	Meenvalloom	Bharathapuzha	3	10.09	Commissioned
2	Attle I & II	Bharathapuzha	12	30	Proposed
3	Gayatri Stage I	Bharathapuzha	0.28	0.45	Proposed
4	Gayatri Stage II	Bharathapuzha	0.37	0.64	Proposed
5	Palakuzhi	Bharathapuzha	1	2.14	On-going
6	Chembukatti	Palakkuzhipuzha	6.5	14.32	In pipeline
7	Koodam Siruvani	Siruvani/ Kallanthode	4	9.76	In pipeline
8	Lower Vattappara	Bharathapuzha	3	21	In pipeline
Total MW/MU			32.65	94	

Potential SHPs in Kerala and their MW and MU

years earlier, but for the various avoidable delays on the part of the authorities. It could have generated not less than 9 crore units during this period.

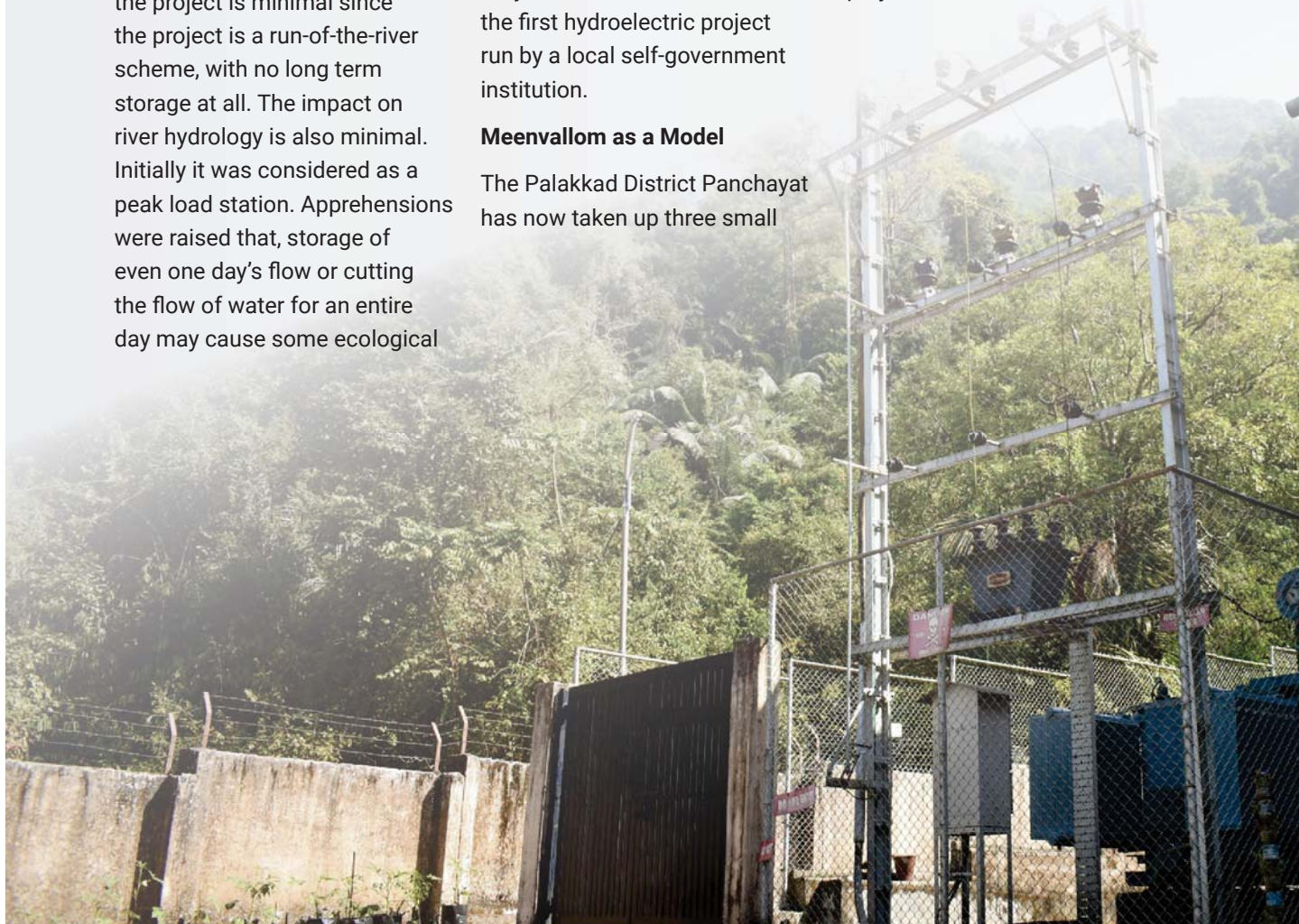
The environmental impact of the project is minimal since the project is a run-of-the-river scheme, with no long term storage at all. The impact on river hydrology is also minimal. Initially it was considered as a peak load station. Apprehensions were raised that, storage of even one day's flow or cutting the flow of water for an entire day may cause some ecological

impact downstream, however minor it may be. During summer there is no peak load generation. Even with all the hurdles and roadblocks mentioned here- in, the Meenvalloom Small Hydro Project has set a land- mark as the first hydroelectric project run by a local self-government institution.

Meenvalloom as a Model

The Palakkad District Panchayat has now taken up three small

and one mini-hydel projects. Construction of all the four projects will begin soon marking the success of Meenvalloom a model for locally owned and operated small hydro power projects.



Conclusion

Meenvallo as a pioneering project in the field of small hydel projects in Kerala is a matter of pride for the entire state for many reasons. The entire project proved how a hydel power generating mechanism could be established without creating much environmental degradation including the construction of huge dams. Also, Meenvallo SHP is the first of its kind undertaken and owned by any District Panchayat in India. It has thus opened new avenues for the local governing bodies. This enhances and establishes the possibilities of decentralized governance and its impact on changing the face of rural India. The technology for such projects, the plans and other procedures were formulated and introduced for the first time in Kerala. Not just implementation, but making it profitable, sustainable and feasible is the biggest challenge

of any project. In Meenvallo, all these challenges were tackled successfully with profit records in each year. This has also paved the way for establishing SHP in other possible locations. A replica of Meenvallo SHP is under construction at Palakkuzhi in Palakkad district.

However, the administrative bottlenecks were solely responsible for the inordinate delay from 1996 to 2014 and cost escalation from 10 crores to 21 crores. It is obvious that most of the delays could have been avoided if the government had established a single window clearing system for SHPs up to 25 MW capacity submitted by local self-governments. This shall include scrutiny of DPR, technical suggestions, all environmental clearances, and if possible, guarantee for the loan. This process can be completed

in 6 months if the government allows the District Panchayat or the small hydro power company to collect an advance against future supply of electricity. All the capital required for building the power station can thus be collected from the consumers. For example, if a consumer gives one lakh rupees she/he would be eligible for 100 units of electricity per month free of cost for 20 years.

Our shared future will not be safe unless we turn to models of living that are sustainable. Power generation and power consumption are crucial areas where the avenues for sustainable models and alternatives exist. Public policies and popular perceptions have to be engineered so as to place the future generations at the centre of all plans. It is hoped that the experience of Meenvallo will serve as a lesson in planning local and sustainable energy solutions.



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APPENDIX

Sl. No.	Description of the Area	Size	Area (m ²)	Area (hectares)
A	CONSTRUCTION AREA			
1	Weir and protective works (d/s)		911.00	0.0911
2	Penstock	490.5*5	2452.50	0.2452
3	Power house, yard, retaining wall, etc.	37*34	1258.00	0.1258
4	Tailrace channel	13.4*4	60.00	0.0060
5	Winch Platform 1	35*3	105.00	0.0105
	Retaining wall boundary to PS8	327.50*3	982.50	0.0982
	PS8 to Platform-3	60*3	180.00	0.0180
	Platform 2	(7*5)+(5*3*0.5)	12.50	0.0012
	Platform 2	10*8	80.00	0.0080
6	Office building	16*8	128.00	0.0128
				9.6198
B	SUBMERGENCE AREA			
	Water spread area at FRL		3000.00	0.30
C	ROAD			
1	Road from forest boundary Mathu's plot to power house	29*7	203.00	0.0203
		26*((7+12)/2)	247.00	0.0247
2	Footpath aside of the penstock route from penstock station No. 8 to the weir site	150*2	300.00	0.03
3	Road from Platform No. 3 to weir site	58*3	174.00	0.017
4	Road from weir site to right bank	70*3	210.00	0.021
5	4 m wide road connecting Meenvallom-Munnekkar road and existing 3m wide road to power house site through forest land (Starting from Devamatha estate and forest boundary at 2633 m chainage - Refer Drg. No.2)	250*4	1000.00	0.100
6	Land required for widening existing	65*1	65.00	0.0065
		43*205	107.00	0.0107
				0.2302
TOTAL				1.15

CONTRIBUTION FROM EQUITY SHARE			
Sl. No	CAPITAL	AMOUNT	TOTAL
1	DISTRICT PANCHAYAT PALAKKAD		3,43,87,540
Block Panchayats			
2	Sree Krishnapuram Block Panchayat	1,00,000	
3	Pattambi Block Panchayat	6,00,000	
4	Palakkad Block Panchayat	3,25,000	
5	Alathur Block Panchayat	34,00,000	
6	Ottappalam Block Panchayat	1,00,000	
7	Mannarkkad Block Panchayat	2,00,000	
8	Nenmara Block Panchayat	10,000	
9	Kuzhalmannam Block Panchayat	2,50,000	59,75,000
Grama Panchayats			
1	Elavanchi Grama Panchayat	1,00,000	
2	Vandazhi Grama Panchayat	3,00,000	
3	Vaniyamkulam Grama Panchayat	3,00,000	
4	Nalleppilly Grama Panchayat	1,00,000	
5	Elappully Grama Panchayat	1,00,000	
6	Karimba Grama Panchayat	1,00,000	
7	Vilayur Grama Panchayat	1,00,000	
8	Karakurissi Grama Panchayat	1,00,000	
9	Thachampara Grama Panchayat	1,00,000	
10	Kongad Grama Panchayat	1,00,000	
11	Erimayir Grama Panchayat	1,00,000	
12	Mundur Grama Panchayat	1,00,000	
13	Akathethara Grama Panchayat	1,00,000	
14	Pudur Grama Panchayat	1,00,000	
15	Polpully Grama Panchayat	1,27,330	
16	Malampuzha Grama Panchayat	2,53,200	
17	Kizhakkancherry Grama Panchayat	2,00,000	
	Total Contribution from share capital		4,27,43,070

Grant received from District Panchayat	
BRGF	Rs 2,00,00,000.00
Equity	Rs 4,27,43,070.00
Loan	Rs.7,79,33,000.00

Details of NABARD loan (under RIDF XI) received		
Date	Particulars	Amount
24.02.2009	Advance	1,55,86,000
10.03.2011	1 instalment	89,75,000
06.08.2011	2 instalment	89,25,000
25.01.2012	3 instalment	80,05,000
22.09.2012	4 instalment	51,19,000
08.04.2013	5 instalment	68,90,000
08.07.2013	6 instalment	2,44,33,000
Total loan Received		7,79,33,000

Meenvalloam - Yearly production and amount received from KSEB by Palakkad Small Hydel Company

Year	Units	Amount received (INR)
2014-15	3821150	12692398
2015-16	5556800	31927887
2016-17	5984520	28474347
2017-18	7646380	36381477
2018-19	7467760	35531601
Total	30476610	145007710

Meenvalloom Small Hydel Project, the first of its kind owned by a district panchayat in India was established with the technical support of Integrated Rural Technology Centre (IRTC). IRTC is an autonomous research and development organisation that envisions the upliftment of the underprivileged sections of the society through knowledge, technology and skill transfer. The institution intervenes to meet the new age challenges and find sustainable solutions in the sectors of solid waste management, watershed development, energy management and livelihood. IRTC has played a pivotal role in handholding the local self-government institutions across the state through planning, DPR preparation and project implementation in these sectors.

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978-81-941237-8-5

Price: INR 200

