



ADMINISTRATIVE REFORMS COMMISSION
GOVERNMENT OF KERALA

SEVENTH REPORT

Public Infrastructure
Development & Management

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In Partnership with:

CENTRE FOR MANAGEMENT DEVELOPMENT
Thiruvananthapuram

Foreword

Infrastructure development includes economic/physical infrastructure and social infrastructure. The term 'infrastructure' does not have universal definition. World Development Report (1994) divides infrastructure into 'economic or physical infrastructure and social infrastructure'. Former includes services like electricity, transport, roads, water system, communications, irrigation etc., and social infrastructure includes education and health services. Public Infrastructure is commonly defined as the physical framework of facilities through which goods and services are provided to the public. In this report the Commission has studied infrastructure sector in Kerala with focus on physical infrastructure.

Overall development of any nation is the result of synchronous development of economic/physical and social infrastructure. It is well recognised that one percent additional investment in infrastructure development produce proportionate growth in GDP.

Quality of physical infrastructure has direct correlation with the quality of services provided through social infrastructure. Physical infrastructure built up over the years has played a significant part in the achievements of the state in physical quality of life index. However, over the years inefficiencies and obsolescence have crept into the sector and absence of regular maintenance has resulted in deterioration of many assets. Capacity development of officials in latest technological advances and resultant reluctance to adopt innovations in construction sector also affects quality of infrastructure. Defects in the planning process, from conception to completion of construction has resulted in time and cost overruns, deficiency in realisation of expected outcomes etc.

Sub optimal utilisation of available infrastructure is also an issue. Many government organisations are functioning with space constraints/limitations in availability of sufficient space for proper delivery of services. At the same time many government buildings and office spaces remain unutilised/underutilised. But organisations are reluctant/unwilling to share even spaces that are vacant for a long time.

Paucity of funds for infrastructure development is not the sole constraint for accelerated

infrastructure development in the state. Deficiencies in planning, design, implementation, operation, maintenance, adoption of latest available technology and capacity development of technical personnel are reasons for delay in completion of infrastructure projects and timely utilisation of assets created.

In this report the Commission studied issues related to development, operation and maintenance of public infrastructure in Kerala including few aspects of construction /maintenance of road assets and other issues in infrastructure development including infrastructure financing. The report is submitted to government with the request to study and adopt recommendations in the report, for rejuvenation of public infrastructure in the state.

Thiruvananthapuram
Date: 27.08.2020



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List of Abbreviations

AE	Assistant Engineer
AEE	Assistant Executive Engineer
AMC	Asset Maintenance Contract
AMS	Asset Management System
ANERT	Agency for Non-conventional Energy and Rural Technology
ARC	Administrative Reforms Commission
AS	Administrative Sanction
ASI	Assistant Superintendent of Police
AV	Audio Visual
BIM	Building Information Model
BPRD	Bureau of Police Research and Development
CCTNS	Crime and Criminal Tracking Network System
CCTV	Closed Circuit Television
CE	Chief Engineer
CMD	Centre for Management Development
COSTFORD	Centre of Science and Technology for Rural Development
CPO	Civil Police Officer
CSR	Corporate Social Responsibility
CT	Computed Tomography
CTE	Chief Technical Examiner
DDE	Deputy Director of Education
DEO	District Education Officer
DGE	Director General of Education
DHS	Director of Health Services
DMO	District Medical Officer
DPC	District Police Chief
DPR	Detailed Project Report
DSJO	District Social Justice Officer
EG	Expert Group
EIA	Environment Impact Assessment
ENT	Ears Nose Throat
EPC	Engineering Procurement Construction
ERP	Enterprise Resource Planning
ESZ	Eco Sensitive Zone

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FHC	Family Health Centre
FIR	First Information Report
FS	Fund Sanction
GIS	Geographic Information System
GoI	Government of India
GoK	Government of Kerala
GVHSS	Government Vocational Higher Secondary School
HMIS	Hospital Management Information System
HMS	Hospital Management Committee
HPCEP	High Power Committee for Expediting Projects
HQ	Head Quarters
HR	Human Resource
HT	High Tension
IAS	Indian Administrative Service
ICP	Individual Care Plan
ICT	Information and Communication Technology
IIT	Indian Institute of Technology
IMG	Institute of Management in Government
IMP	Infrastructure Master Plan
INR	Indian National Rupee
IoT	Internet of Things
IP	In Patient
ISO	International Organization for Standardization
IT	Information Technology
JE	Junior Engineer
JSSK	Janani Shishu Suraksha Karyakaram
KHRWS	Kerala Health Research and Welfare Society
KIIFB	Kerala Infrastructure Investment Fund Board
KITCO	Kerala Industrial and Technical Consultancy Organization
KITE	Kerala Infrastructure and Technology for Education
KPHCC	Kerala Police Housing & Construction Corp Ltd
KPI	Key Performance Indicators
KSCC	Kerala State Construction Corporation Ltd
KSEB	Kerala State Electricity Board
KSSM	Kerala Social Security Mission
KSTP	Kerala State Transport Project
KWA	Kerala Water Authority
LED	Light Emitting Diode

List of Abbreviations

LIDAR	Light Detection and Ranging Technology
LSGD	Local Self Government Department
LT	Low Tension
Mbps	Megabits per second
MC	Management Committee
MCH	Medical College Hospital
MDR-TB	Multi-drug Resistant Tuberculosis
MIS	Management Information System
MLA	Member of Legislative Assembly
MLASDF	Member of Legislative Assembly Special Development Fund
MO	Medical Officer
MOS	Material Objects
MoSPI	Ministry of Statistics and Programme Implementation
MP	Member of Parliament
MPLAD	Member of Parliament Local Area Development
MRI	Magnetic Resonance Imaging
MS	Medical Superintendent
MSDP	Multi Sectoral Development Programme
NABARD	National Bank for Agriculture and Rural Development
NABH	National Accreditation Board for Hospitals
NATPAC	National Transport Planning and Research Centre
NCC	National Cadet Corps
NCD	Non-Communicable Diseases
NGO	Non-Governmental Organization
NHM	National Health Mission
NHRC	National Human Rights Commission
NID	National Institute of Design
NIMHANS	National Institute of Mental Health and Neuro-Sciences
NIT	National Institute of Technology
NQAS	National Quality Assurance Standards
NSQF	National Skill Qualification Framework
OBC	Other Backward Community
OPD	Out Patient Department
PHC	Public Health Centre
PHQ	Police Head Quarters
PMBOK	Project Management Body of Knowledge
PMP	Project Management Professional

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PMIS	Project Management Information System
PMU	Programme Management Unit
POCSO	Protection of Children from Sexual Offences
PRO	Public Relations Officer
PTA	Parent Teachers Association
PWD	Public Works Department
QA	Quality Assurance
QC	Quality Control
RFP	Request for Proposal
RFQ	Request for Qualification
RIDEF	Rural Infrastructure Development Fund
SC	Scheduled Caste
SE	Superintending Engineer
SHO	Station House Officer
SMC	School Management Committee
SMDC	School Management Development Committee
SOP	Standard Operating Procedure
SP	Superintendent of Police
SPC	Student Police Cadet
SPV	Special Purpose Vehicle
SR	Sub Registrar
SRO	Sub Registrar's Office
ST	Scheduled Tribe
STP	Sewage Treatment Plant
SWI	Social Welfare Institution
TOR	Terms of Reference
TRIDA	Trivandrum Development Authority
TS	Technical Sanction
UAV	Unmanned Aerial Vehicle
ULB	Urban Local Body
UPS	Uninterruptible Power Source
WAPCOS	Water and Power Consultancy Services Limited
WO	Work Order

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Introduction

Effective functioning of government requires support of well organized and efficient administrative system. The system needs to be dynamic and subject to constant review to ensure that it is concomitant with changing demands of its stakeholders- both internal and external. Timely reviews and revisions in governance systems and processes are necessary to ensure dynamism and flexibility in administration.

Administrative Reforms Commissions are one of the institutional mechanisms available to Government to periodically study, from a third person perspective government processes and to examine whether the processes meet stakeholder expectations. The Commissions are mandated to suggest recommendations to reduce the gap between expected and actual standards of service delivery. Special emphasis is placed on people's right to information, interventions to address issues of the backward classes, social entrepreneurship, land use, scientific land/water usage, human resources development and employment generation etc.

Government of Kerala constituted the 4th Administrative Reforms Commission in August 2016 to make recommendations to improve the efficiency of the state administrative system. The Commission is responsible for reviewing structure and functioning of the administrative machinery of Kerala and recommend measures to improve its responsiveness, efficiency, and effectiveness. It is entrusted to make suggestions in selected areas of public administration and is constituted with former Chief Minister Shri. V. S Achuthanandan MLA as its Chairperson.

Quality of infrastructure forms the basis for effective delivery of services by governments. Development indices of a society can be gauged through the quality of infrastructure available to society. It is an important aspect of the economy, as any investment in infrastructure has a direct impact on economy. There is no universal definition of the term 'infrastructure'. World Development Report (1994) divides infrastructure into 'economic or physical infrastructure and social infrastructure'. Economic infrastructure includes services like electricity, transport, roads, water system, communications, irrigation etc., and social infrastructure includes education and health services. In this report the Commission intends to study the public infrastructure sector in Kerala.

Public Infrastructure is commonly defined as the physical framework of facilities through which goods and services are provided to the public. For the purpose of the study Public Infrastructure is taken as the subset of infrastructure sector which include schools, public offices, hospitals, roads, bus stations, social welfare institutions etc.

Objectives

Main objective of the study is to identify reasons for time delays and cost over runs in creation of social assets in the state and other governance issues in infrastructure development and management. The report also discusses few aspects of development of road infrastructure in the state. As an outcome, the study aims to suggest changes in governance systems and processes, skill up-gradation and training of human resources and technological changes. It aims to make recommendations to ensure that assets are created within defined timelines and budgets.

Methodology

Committee of experts was constituted for assisting ARC in the study. Centre for Management Development (CMD) partnered with the Commission in preparation of the report. Questionnaires were used for collecting information on selected social assets. Study team visited selected institutions and held discussions with officials. Focus Group discussions were conducted. Discussions were held with representatives of all concerned departments and agencies of government for gathering information on asset formation and maintenance.

Report Format

The report includes Executive Summary, Introduction and five chapters in three parts:

Part 1. Study based on life-cycle approach of selected public assets (15 Nos) in three districts—Thiruvananthapuram, Kasaragod and Wayanad, analyses reasons for time and cost overruns from planning and budgeting to completion, and delay in timely maintenance of the assets.

Part 2. Road Infrastructure including design of intersections—A few observations.

Part 3. Infrastructure Development and Management.

Executive Summary

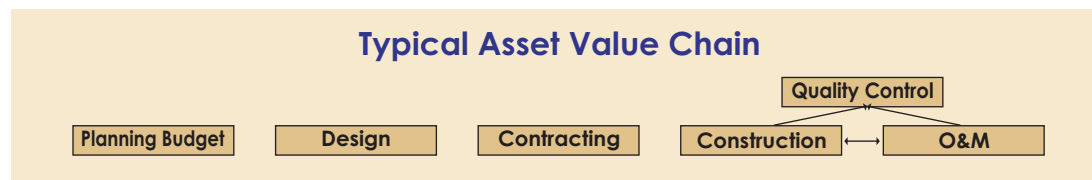
Administrative Reforms Commission (ARC) focuses on bringing about reforms to improve/change response of state administration to changing aspirations of people. It plays a crucial role in assessing expectations of people from government system and in making sure that current standards of service delivery are in line with needs of people. Government of Kerala has set up four Administrative Reforms Commissions (ARCs) since formation of the state in 1956, to suggest measures improving efficiency and effectiveness of administration of the state. One of the terms of reference of the fourth ARC is study of optimum usage of infrastructure and reasons for delays in infrastructure creation – resulting in cost overruns. Objectives of the study include identifying reasons for time delays and cost over runs in creation of public assets in Kerala. As an outcome, the study suggests changes in governance, processes, technology adoption and human resource management that, if implemented will ensure creation of assets within defined timelines and budgets. In addition, this report discusses few aspects of road infrastructure in Kerala and infrastructure—development and management. The report is in three parts viz. **Part 1- Public Infrastructure- Life cycle approach, Part 2- Road Infrastructure, Part 3- Infrastructure- Development and Management.** The Commission has partnered with Centre for Management Development (CMD) for the study and in preparation of the report.

Approach (Ref: Chapter 1)

It is well reported that government projects face time and cost overruns. Statistics of the Ministry of Statistics and Programme Implementation (MoSPI) in 2019 suggest that as many as 388 infrastructure projects in India (worth INR 150 crores and more) are hit by cost overruns of more than INR 4 lakh crores and 563 projects have reported time escalation. This study, in a limited way examines specific public assets in Kerala and reasons for delays in construction of the assets.

The Commission have adopted life-cycle based approach for Part 1 of this study-analysing reasons for time and cost overruns from planning/ budgeting to handing over and maintenance by user department. The study is confined to 15 public assets across three districts-Thiruvananthapuram, Kasaragod, and Wayanad. A typical asset value

chain used for the study is shown below:



Planning Phase is where the departments gather requirements from user departments and stakeholders. Therefore, while examining this phase, the study looked into aspects such as stakeholder consultations and their comprehensiveness, preparation of feasibility reports etc. Planning Phase is followed by the Design Phase where requirements of the intending department are translated into a Detailed Project Report (DPR), with due consideration of the techno-economic aspects of the project. Here, the study team examined the aspects which affect the quality of DPRs, whether standard guidelines are followed for DPR preparation, and whether stakeholder consultations continued into this phase or not. For the Contracting Phase, the contract document- a techno-commercial-legal document was examined closely, as a poorly/ hastily drafted contract document tends to cause delays during Construction Phase. To identify gaps, contract documents are compared with best in class contract documents of agencies like World Bank and ADB. Due importance is given to evaluation used for selection of contractor. Construction, which follows contracting, is mainly concerned with enforcement of the contract. Therefore, the approach followed in this phase is to examine steps that departments take to enforce the contract – the mechanisms taken to pin delays on contractor (where genuine), and mechanisms taken to identify, flag and quickly resolve delays. In the next phase of Quality Control (QC), it was examined whether QC requirements mentioned in the bid documents are adhered to, monitored, and accurately reported in the field. Finally, to ensure durability and sustained use of an asset, effective maintenance is required. For analysing effectiveness of maintenance of the assets different public assets were studied on the basis of the processes that are in place to ensure upkeep, cleanliness and hygiene, and to rectify defects that come up in routine use of the asset. Presence or absence of citizen grievance redressal and escalation process is also examined.

Methodology (Ref: Chapter 1)

The study is done in three phases–i.e. diagnostic, observation, and recommendation phases. In the diagnostic stage, individual assets along the asset value chain are analysed

through administration of questionnaires, focus group discussions, and study of documents such as feasibility reports, Detailed Project Report (DPR), contracts issued to the contractors, and other available documents.

Subsequently, observations are made through field visits to the 15 identified assets, one-on-one meetings with asset owners as well as asset users, meetings with the departments involved in the construction of these assets including the PWD, KPHCC and the LSGD. Observations are also made based on study of documents such as DPRs, feasibility reports, files, asset registers etc.

Inputs gathered from the above three phases are used to arrive at gaps and suggest recommendations to reduce time and cost overruns in the asset lifecycle starting from planning till the management phase. Recommendations include process changes, leveraging on technology, and people related changes.

As – Is Study (Ref: Chapter 2)

In this chapter, detailed observations and findings across the fifteen assets in three districts are provided. For purposes of consistency, this chapter is structured along the asset value chain.

Planning/Budgeting Phase (Ref: Section 2.1)

Planning of a project is a crucial step in the asset value chain. It involves defining goals, and carrying out stakeholder consultations, to ensure that the assets meet needs of the users. Of the fifteen assets visited, several assets are constructed many years in the past and hence users of the assets were unable to provide inputs on the planning phase. However, observations are made based on recently constructed assets (last five years). It is seen that only limited or one-time stakeholder consultations are held during project formulation phase, and the process is carried out without any template or defined acceptable end state. Discussions are carried out by incumbent engineers based on their experience. It is also seen that since budget is available only for a year with no multi-year visibility, planning process is compromised to quickly move to construction phase so that funds available in the year are utilised. This results in scenarios where ad-hoc constructions/expansions are carried out resulting in unplanned growth of assets. In hospitals, for example, it is seen that wards are scattered, labs/ imaging units situated

away from OPD/IP units etc. resulting in inefficiencies in use of the facilities by clinicians and citizens. In schools it is seen that disconnected classrooms are constructed as the Gram/Block Panchayats give funds only for 1 or 2 classrooms in a year. It is also noted that there is lack of a central repository of previously approved designs/drawings/plans or any other literature on planning. This meant that with every transfer of an engineer, incoming engineer had significant issues in deciding on augmenting the asset – since confidence in available documentation was limited.

Design Phase (Ref: Section 2.2)

In the design phase, the initial plans are converted into concrete plans which are compiled in the form of a Detailed Project Report. During discussions it was seen that designs/drawings on the DPRs in one instance, did not match construction at the site. Quality of DPRs (and the vendors that made them) varied based on the agency that commissioned the study. For example, KIIFB and KSTP DPRs are seen to be more comprehensive than other DPRs studied.

It is seen that the engineers are not always aware of latest design standards, and this lack of information is reflected in DPRs. It is also seen that there are limited (or non-documented) consultations during this phase. The selection process of design/ DPR Study team requires a re-look as the evaluation process is carried out without any assessment of the quality of past work done (perhaps through presentations by the Study team), or an assessment of aesthetics of the assets created etc. Design aspects are becoming more crucial in the backdrop of issues related to climate change and frequent occurrence of natural calamity. Typical designs of buildings done by PWD and other agencies need to be replaced by innovative designs incorporating eco-friendly norms and suitable for changing climatic conditions.

Contracting Phase (Ref: Section 2.3)

In the contracting phase, it is noted that the RFPs, although standardised in some cases had gaps. RFPs are the only document that binds the contractor to the client (i.e. the government) and therefore need to be technically, commercially, and legally sound. Such documents are normally drafted by engineers and approved by administrators – and therefore require legal and commercial vetting.

The RFPs did not adequately detail the evaluation criteria for selection of contractors

(and only specified financial criteria for selection), lacked detailed work plan that the contractor is expected to adhere to, lacked job descriptions of the site and managerial teams of the contractors (required for large projects), and also did not specify any format of monthly reviews that would make the contractor accountable to the government. Finally, with most construction now done through contractors, the need to adhere to running bill systems (viz-a-viz milestone-based payments) need to be looked into.

Construction Phase (Ref: Section 2.4)

This phase is about enforcement of the contract. Enforcement requires consistent and standardised monitoring. It is seen that there is no mechanism for systematic review of projects at any level – and this is perhaps one of the most significant gaps identified in this study. It is noted that data is reported to higher authorities on a need basis but there is no regular rigorous review – in which technical progress, financial progress, presence/absence of contractor manpower at site, adherence to work plan commitments, adherence to QC practices etc, are reviewed and deviations documented. It is reported that in many cases similar data is reported in varying formats for use by different authorities – consuming considerable time of workforce in the field. Absence of use of any form of technology solution (except in KIIFB, which has digitised almost all their project practices) is also noticed consistently across all assets studied. This meant that project delays are not getting escalated to levels at which they need to be escalated within a fixed timeline. Delays in payments to contractors leading to higher requirements of working capital are also reported. In the absence of use of technology, date of submission of the invoice by the vendor is not tracked and therefore delays on the government's side at operational level are not flagged.

In two cases it is also seen that while the construction is completed, the asset is in disuse due to non-sanctioning of HT connection and non-installation of electrical fixtures (as civil and electrical works are tendered separately by separate wings). This resulted in assets being constructed and depreciated without being used.

Quality Control Phase (Ref: Section 2.5)

Quality Control aims to ensure that there are no defects in the finished product/service. QC is a continuous process that requires site documentation, mandatory testing of materials and work, field and regional testing laboratories, manufacturer's test

certificates, departmental inspection teams, checklist for works, and evaluation of the completed works – all monitored consistently through the review meetings. For this, Public Works Department has well defined three tier QC process. However, it is noted that there are several inconsistencies in the authenticity of the QC tests conducted on-site. It is reported that the site teams invite QC teams to carry out tests (rather than random inspections), and contractors ‘supplied’ materials for tests rather than testing materials obtained from sites. In one case the test certificate was found to contain only reference ranges without reporting the actual test result. Absence of training of staff on QC processes and adherence to standards meant that the engineers themselves mentioned their limited ability to enforce QC requirements.

Operations and Maintenance Phase (Ref: Section 2.6)

Proper O&M is required for the upkeep of assets. O&M process can either be routine or need based. Some issues noted at this phase are lack of routine maintenance, possibly due to lack of funds or lack of initiative on the part of the officials. It is noticed that this was exacerbated by the absence of centralised citizen complaint reporting system– which meant that complaints could remain unresolved for very long as they are not even brought to the notice of senior officials. Inadequate/low financial delegation and minimal amount in imprest account (Rs. 100 – 500 in some cases) meant that idle time to repair was high in case of equipment breakdown– and caused issues in assets like hospitals. From the sample cases it is seen that time taken to obtain funds for service/ maintenance is in the range of one year to two years. Provisions in the PWD Manual and Asset Maintenance Manual for LSGIs on inspections were also referred for the study. Asset Maintenance Fund Scheme in Finance department was examined for recommendations on maintenance.

Recommendations (Ref: Chapter 3, 4 & 5)

This chapter provides measures that the Government of Kerala can adopt to ensure on-time, and within cost implementation of government projects. Attempt is made to recommend easily implementable solutions rather than larger sweeping reforms. It may be noted that considerable focus is on IT enablement – particularly in contracting, construction, QC, and maintenance phases. The study also includes specific mention of KIIFB and the processes it has adopted as these are in line with best practices– including appropriate technology enablement.

In the planning phase, the recommendations include the preparation of a Model Planning Document which covers detailed need assessment of the asset, ensures adequate stakeholder consultations during the process, and specifies the minimum acceptable outcome of a planning process. Recommendations are also made for adoption of a multi-year planning and budgeting process (three year rolling plan) which is required for long term perspective planning and for maintaining centrally retrievable repository of past works, documents and learnings from successful and unsuccessful works through an IT system for continuous improvement of processes and better training of incumbents.

In the design phase, the recommendations include selecting higher quality design by replacing the lowest cost method of selection with qualitative and subjective assessment. It is proposed that the assessment include presentation by bidders, weightage to aesthetics (assessed through images/videos of the assets designed/constructed), green infrastructure, bidder's incorporation of locally available materials etc. It is also proposed to define standard DPRs (asset wise) and define minimum acceptable requirements (as done by KIIFB). Continuing the stakeholder engagement process even during the design stage so that design of the assets is in line with needs of the asset user, is also recommended.

The single most important recommendation in the **contracting phase** is strengthening of contract documentation process and capabilities. Importance of the bid document cannot be over emphasised as it forms the basis to hold the contractor accountable for the construction activities. Recommendations include the inclusion of work plans, dependency clauses that link supply and work execution, mandatory induction training and certification of employees in contracts and contract management before being promoted (beyond EE level), milestone based payments, definition of qualifications of project level and site level teams along with job descriptions, and defining review process (along with review templates) in the bid documents itself.

In the **Quality Control phase**, no new recommendations are made on the QC process per-se. Recommendations are primarily on enforcing rules already mentioned in the PWD manual. This requires an IT based system in which test reports are digitally stored so that they can be monitored centrally. Enforcement of QC provisions will also require that QC independently report to head of the organisation (just as audit reports are independent of the Head of Accounts in private sector organisations). If QC is to be made a culture in the Government, it will also require that training is provided to all new

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recruits and to existing employees. Modern methods of online training, in which completion or non-completion of a training programme by an engineer can be easily tracked needs to be adopted going forward.

For the **Maintenance phase**, it is recommended that, checklists be introduced for routine maintenance – checklists that are publicly available for audit (or centrally trackable through an IT system), implementation of a citizen centric grievance reporting and redressal mechanism (through an App based system) and bringing together non-governmental organisations for mapping of assets locally to support asset management activities. Delegation of financial authority of officers and availability of ‘imprest’ amounts need to be enhanced if effective maintenance is to be carried out without delay. Creation of Asset Register as instructed in PWD Manual and Asset Maintenance Manual for LSGIs is reiterated in the recommendations. A comprehensive scheme for Asset Management of all government departments is also recommended.

In addition to the above recommendations that are made along the value chain of an asset, some **cross-cutting recommendations are also made in the report**. These include a) moving towards lifecycle cost approach rather than the lowest cost approach, b) ‘Technology First’ rather than as an add-on tool for decision making – this includes use of ERP systems (for HR and Accounts), Project Management systems, e-Office and Asset Management Systems; c) Mandatory induction training and in-service training (to be linked to promotions), d) Encouraging recruits to take up professional certifications (such as PMP and CFA), e) introduction of performance based promotion system and f) introduction of rewards system among employees.

Recommendations made in Part 1 of the report are prioritised based on their ease of implementation and cost involved in implementation. An indicative prioritisation for rolling out the recommendations is included in this report. The priority is accorded as ‘high’, ‘medium’ or ‘low’. In prioritising recommendations higher priority is accorded to recommendations that have low dependencies, are seen to be politically acceptable, and can be implemented in shorter timeframes at low cost.

In Part 2- Road Infrastructure, recommendations focus on issues and action in the planning, construction and operational stages including fallout from non- adherence to IRC and MoRTH standards and specifications.

Part 3-Infrastructure Development & Management, includes recommendations on infrastructure financing especially extra budgetary sources of funds, Asset Maintenance Fund scheme, creation of project financing cell in Government, setting up of an institute for project Management and developing Infrastructure Master Plan for Kerala.

PART-2

Social Infrastructure-Life Cycle Approach

1. Approach and Methodology.

Ministry of Statistics and Programme Implementation (MoSPI), Government of India, monitors projects of INR 150 Crore and above. According to the November 2019 report of the MoSPI presently 1635 projects are in different stages of implementation in the country. Of these, 377 have cost over-runs and 552 have time over-runs. Out of the 552 projects with time over-runs, it is seen that, 181¹ projects have overall delay in the range of 1 to 12 months, 128 projects 13 to 24 months, 127 projects reflect delay in the range of 25 to 60 months and 116 projects show delay of 61 months and above – with an average delay of around 38 months. Cost over-run on account of the above is estimated at INR 3.89 Lakh Crore, or 20% of the original cost. Similarly, a study² carried out in Kerala in 2010 reported that over 85% of infrastructure projects taken up in the state are delayed.

Reasons for delay cited include delays in the planning stage, obtaining clearances, obtaining land, inter-departmental co-ordination issues, shortage of labour, inadequate mobilization by the contractor, shortage of funds, geological surprises etc. While some delays are perhaps unavoidable, others are seen to be avoidable and if not, controllable. To ensure that all such aspects are comprehensively studied, the overall ‘Project Value Chain’ approach is adopted in Part 1 of the report. This approach is explained below.

1.1 Approach

Since delays in a project could take place at any phase along its life cycle, life-cycle based approach analysing reasons for time and cost overruns from the planning/ budgeting phase to handing over and maintenance by the user department, is adopted for the study. A typical asset value chain and the components relevant to each phase of the value chain is shown in Fig:1-1.

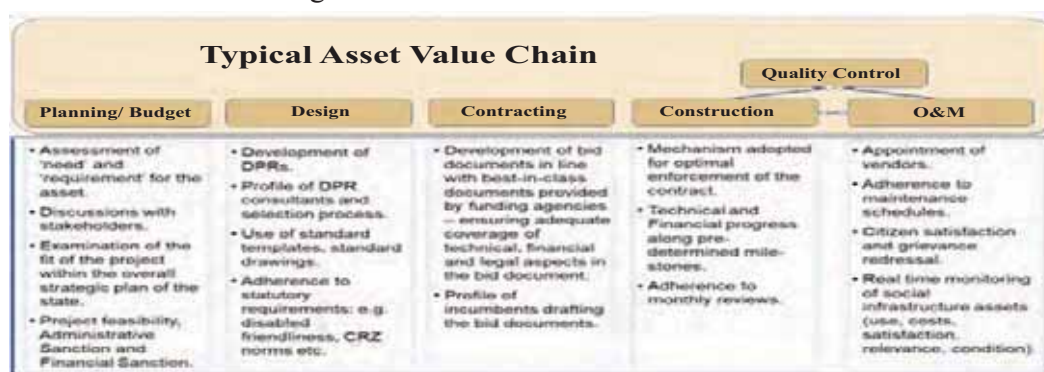


Figure 1-1: The Asset Value Chain

¹ Reported in the August 2019 report of the MoSPI.

² Report of the High-Power Committee to Expedite Projects (HPCEP)

Six phases along the value chain are explained in more detail below:

1.1.1 Planning/Budgeting

This is the ‘requirement gathering phase’ where the user department examines its ‘need’ and ‘requirement’ from the stakeholders. Proper investment of time and resources in the planning phase of a project has a huge bearing on timely completion of projects within stipulated budgets. Comprehensively planned project can be executed smoothly with minimum bottlenecks.

While keeping in mind the necessary activities that need to be carried out during an ideal planning process, the study examined whether adequate stakeholder consultations were held since project conceptualisation, comprehensive feasibility reports were prepared considering ecological, economic, local and social factors. Comprehensiveness of the planning exercise, and the time taken for the same were also examined. For example, the extent of details in the minutes of the meetings prepared in the planning phase, documentation (and templates) used in the planning phase, linkage of these documents to subsequent parts of the project, use of technology (if-any), parameters considered etc. It was also examined whether adequate feasibility studies were carried out, and in case of issues identified, whether adequate steps are taken towards mitigation.

It is recognised by ARC that there would be instances where feasibility of project is not considered on financial terms—e.g. school, police station or old-age home. In such cases, it was examined whether other aspects of feasibility such as accessibility, demographics of the local area, proximity to similar assets etc. were considered while preparing the reports.

1.1.2 Design

Design phase of a project involves translating requirements of the administrative department into a Detailed Project Report (DPR), considering techno-economic aspects of the project. A comprehensive DPR include geographical and demographic factors, feasibility studies, project costs, environmental considerations, cost-benefit analysis etc. Thus, in analysing the design phase profile of the design Study team was examined, i.e., whether, DPRs are prepared by a team having prior experience in the same functional fields, standard guidelines were followed for DPR preparation, and whether stakeholder consultations continued into this phase or not. These factors are important as the quality of the DPR would impact the quality of the final output, as the DPR in essence becomes the input to the contract – to be executed by the construction contractor.

1.1.3 Contracting

The contracting phase begins with drafting of Expression of Interest (EoI) by the concerned department followed by Request for Proposal (RFP) to attract eligible bidders interested in the project. A bidder who meets the required criteria is shortlisted by the administrative department, agreement drafted and signed by both parties and Work Order (WO) awarded to the shortlisted contractor. Once the site is handed over, work commences as per the work plan prepared during the contracting phase. The work plan becomes the basis for construction, testing (since the plan should mention tentative testing dates), and commissioning of different components of the project. Though major responsibility for implementation in this phase lies with the contractor, it is expected that the asset owner – i.e. the Government department, would be prompt in facilitating on-time completion by the contractor.

The contract document is a techno-commercial-legal document that forms the basis of this phase and is perhaps the most important aspect of a project as a poorly drafted contract document (with DPR) will create issues during construction phase.

It is commonly accepted that bid documents prepared by funding agencies such as World Bank, Asian Development Bank (ADB), KfW (a German state-owned development bank) etc. are balanced in terms and conditions and also factor in most aspects in their ‘model bid documents’. Contracting practices of Delhi Metro Rail Corporation (DMRC), and PowerGrid Corporation of India Limited (PGCIL) are best in class. Hence these contract documents are used as the templates to compare contract documents of the concerned departments. Gaps, if any, are brought out and examined in detail.

Another aspect that has been examined in the contracting phase is the process of selection of the contractor. For example, the evaluation metrics to select a contractor who is to design, build, and operate a hospital would be quite different from the metrics used to evaluate a contractor appointed to construct a building. The importance of aesthetics and the inclusion of adequate clauses in the bid document that give weightage for a better aesthetic or sustainable design are also examined.

1.1.4 Construction

Once the contractor is appointed, the next phase is essentially about enforcing the contract. This phase commences with the issue of the Work Order and site hand-over

letter to the Contractor. The work is carried out based on the work schedule incorporated in the contract. All the steps that are to be taken during construction should be reflected in the contract document. Thus, quality construction is the outcome of quality planning and contracting. The approach followed in this phase is along these lines.

Systematic enforcement of the contract is possible only through systematic review with the contractor. Therefore, mechanisms adopted by the departments for systematic review of projects are examined. This is particularly important to identify reasons for delay and to ensure accountability if delay is established. An effective contract with rigorous review mechanism ensures accountability from both the contractor and administrative department, ensuring adherence to time and project cost schedules.

1.1.5 Quality Control

Quality Control (QC) includes a set of observation techniques to ensure that the asset under construction meets prescribed standards. Examples of quality control activities include site inspection, factory inspection, pre-dispatch inspections, and testing processes.

To examine the adherence to the quality control process, the study team examined whether the QC requirements mentioned in the bid documents are adhered to, monitored and accurately reported in the field.

1.1.6 Operations & Maintenance (O&M)

It is well documented that effective maintenance is required to ensure durability and sustained use of an asset. This is especially true in the case of social/ public assets such as government schools, hospitals and police stations which see remarkably high citizen footfall on a daily basis. In analysing the O&M process, the study team looked at different social assets on the basis of their user friendliness, cleanliness, degree of citizen satisfaction with the use of the asset, grievance redressal and escalation processes to understand how effectively O&M is being carried out and what measures are needed to make routine maintenance the norm in such places.

1.2 Methodology

Individual assets along the asset value chain area analysed. Analysis was done through:

Administration of questionnaires: Questionnaires to capture basic details of assets were sent to concerned offices prior to visit by the team. The questionnaire included details of ownership, location, details of land, financial details (budget v/s actual cost), timelines of asset creation (planning to hand-over), asset condition (extent of use, quality of up-keep, contractor details (construction phase, O&M phase), project governance mechanism (planning phase, construction phase, O&M phase) etc.

Sl.	Document to be shared	Please fill in here
1	Name of the asset	
2	Address where asset is located	
3	Administrative department responsible for the asset	
4	Initial contracting value (as per DPR)	
5	Final cost of construction of the asset (i.e. total cost incurred in Rs. as at the time of issue of completion certificate)	
6	Time estimated for construction (as per DPR)	
7	Actual time taken for completion (From date of issue of work order to date of issue of completion certificate)	
8	Total land area on which the asset is situated? (acres)	
9	Total constructed area (sq. ft)?	

Figure 1-2: Snapshot of questionnaire sent to the asset owners for basic data capture

Focus Group Discussions: Detailed information, in addition to the details captured through the questionnaires was obtained through field visits to each asset. During these visits, discussions were held with heads of office/senior officials/ superintendents and users of the asset to understand the asset lifecycle from planning till operations & maintenance phase. In addition, visits were also undertaken to the concerned departments and to PWD offices (wherever PWD was entrusted with construction and maintenance of the asset) to obtain inputs.

Study of Documents: Documents such as feasibility reports, Detailed Project Report (DPR), contract issued to the contractor for construction of the asset and contract issued

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to the contractor(s) for maintenance of the asset were studied during the visits, wherever such information was made available.

After initial visits to the 5 assets in Trivandrum, it was found that most assets were constructed years back and availability of the above documents was limited. Hence, DPRs of 'similar' assets available with the Centre for Management Development were studied. Subsequently recently constructed assets were taken up for study.

Observations: Observations were made through field visits to the 15 identified assets, one-on-one meetings with asset owners as well as asset users, project needs, meetings with the departments involved in the construction of these assets including the PWD, KPHC and the LSGD. Observations were also made based on study of documents including DPRs, Feasibility Reports, files, and asset registers etc.

In cases where documents are examined, observations are based on comparison with standard available documents that are considered to be of acceptable quality. Photographs of the assets and premises are included to substantiate observations in the report.

Recommendations: The inputs gathered from the above three phases are used to arrive at recommendations. These recommendations address measures to be taken to reduce time and cost overruns in the asset lifecycle starting from planning till operations and management phase. These include:

- Governance changes for better project supervision during the project life cycle (from planning to O&M).
- Process changes needed along the value chain to ensure that assets are created a) on-time and b) within budgeted costs.
- Need for leveraging the power of technology.
- Need for capacity building of personnel to adapt to process changes, and
- Plan for implementing the above.

2. As-Is Study of Assets and Observations.

In this chapter, a detailed discussion on the fifteen public assets (schools, hospitals, old age and children's homes, police stations, and administrative offices) visited and studied, across three districts are presented. The chapter is structured along the lines of the asset value chain, introduced in Fig1-1.

Asset value chain consists of six distinct stages and includes planning/ budgeting, design, contracting, construction, quality control and finally maintenance of the asset. Findings of the study along each of these stages are presented below. Relevant inputs, as obtained from the questionnaires, meetings, documents studied, and files examined are provided in each to contextualise the findings.

2.1 Planning/Budgeting

Planning of a project is the most crucial step in the asset value chain. This step involves defining goals/objectives through a set of plans which can help guide smooth implementation of the project. Hence, the active involvement of all stakeholders-including line departments, urban/rural local bodies, local population, people's representatives, and project implementation agencies is a prerequisite for a successful planning process. A well thought out and comprehensive planning process can ensure that project costs are accurately estimated, risks are managed, and the project is implemented on time.

During the course of the study the team visited several public assets. Through meetings and based on examination of documents, following observations are made about the planning process, and each of these has been explained with examples in the subsequent sections of this chapter.

- 1. Limited/one-time stakeholder consultations during project formulation**
- 2. Absence of a defined 'planning process'**
- 3. Need for multi-year planning (instead of annual plans)**
- 4. Lack of document repository and standard checklists**

2.1.1.1. Limited/one-time stakeholder consultations during project formulation

Stakeholder consultations are required at the project conceptualisation phase as well as during the design and DPR preparation phase. This ensures that planning is in line with the expectations and requirements of the stakeholders. It also ensures that any over or under estimation of the asset size is addressed during these multiple rounds of discussions. And most importantly, it introduces a sense of ownership and belonging with respect to the asset.

During discussions with the concerned departments (the departments in charge of the assets), they informed that ‘adequate’ stakeholder consultations take place. Some of the examples that were provided are as follows:

During the visit to Government Girls Higher Secondary School, Nedumangad, the team met the Principal, head of Parents Teachers Association head and few faculty members. The study team was informed that the staff and MLA of the constituency are actively involved in the planning of the hi-tech building which is under construction.

In the Sub – Registrar’s Office in Manjeswaram, Kasaragod it was learned that the initial plan that was prepared by the PWD was later modified after obtaining inputs from the Sub-Registrar and other asset users. Thus, the constructed asset conformed to the needs of the users and is said to be designed to meet the requirements for 100 years.

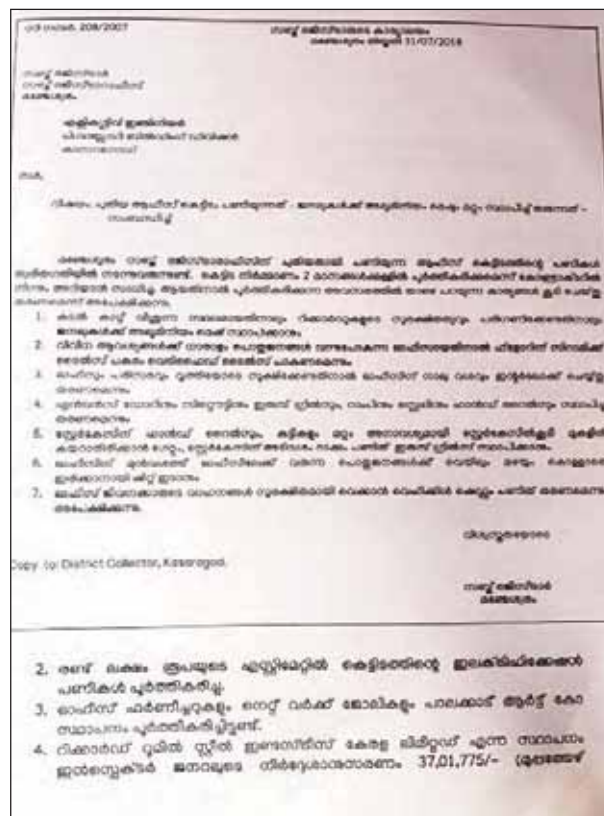


Figure 2-1: Letter from the SRO to PWD with requirements.

However, a study of DPRs of school buildings in Kasaragod district and focus group meetings showed that:

At times, plans are unilaterally prepared by the Panchayat (since they already have with them layouts of the school and are aware of the budget constraints in the given financial year) without consulting the stakeholders. For example, in the Government Vocational Higher Secondary School, Delampady, it was mentioned that the Panchayat came with pre-planned plans.

The stakeholder consultation process is often a one-time process. For instance, DPR of Government Higher Secondary School, Mogral Puthur, Kasaragod showed that minutes of the stakeholder consultations held during the planning phase mentioned only four or five requirements of the stakeholders. The minute is only half a page in length.

While visiting newly constructed building of the Taluk Headquarters Hospital, Sultanbathery it is seen that parts of the constructed building are being demolished and re-constructed (images in Section 2.2.2). Some of the changes made included change in the width of the operation theatre doors to accommodate stretchers, increase in the thickness of the walls of the X-Ray room to comply with National Quality Assurance Standards norms prescribed in India. While these reflect shortcomings in the DPR preparation process, it is also reflective of limitations in planning, as both are interlinked.

The team visited Kalpetta Police Station which was constructed in 2004. At the time of construction, sanctioned strength of the police station was 33 (as against 39 today). After completion of the original building the police station has constructed a temporary structure abutting the existing building. This houses UPS, computers, officer seating, books etc. In addition, it can be seen that space allocated for storing uniforms, case files, evidence details, resting

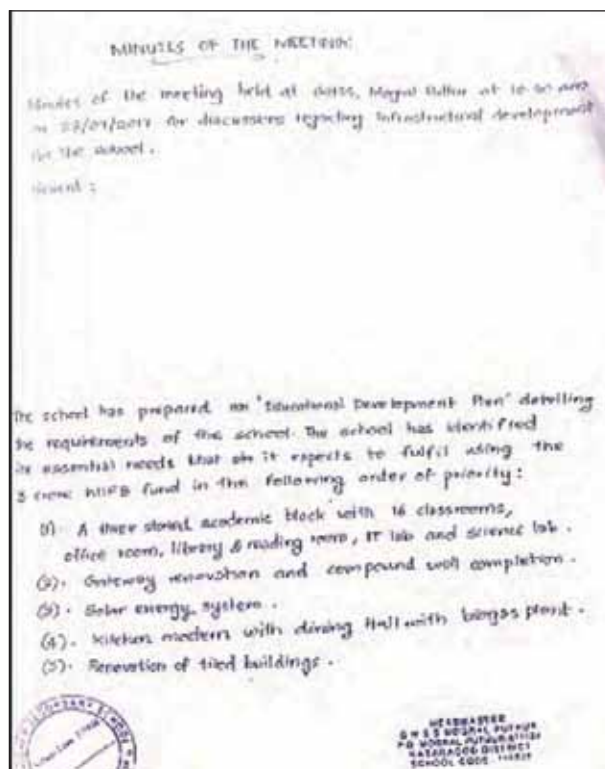


Figure 2-2 Minutes of stakeholder meeting at GHSS,
MogralPuthur, Kasaragod District

facility for the sanctioned manpower etc. is inadequate and would have been inadequate even at the time of construction (since sanctioned manpower has increased only marginally). This may be reflective of an issue of planning - i.e. deciding to construct the asset even though it was known that adequate space is not available. On examination of the files pertaining to construction it is seen that the plan is signed by the Sub-Inspector of the police station.

Note: Limited number of examples is provided in this section on Planning/ Budgeting. This is because of the fifteen assets visited, only five³ are in planning (or recently constructed) stage. Therefore, documentation pertaining to planning of these assets was not available. For example, the Museum Police Station at Trivandrum was constructed in 1993. While the police station is in serious need of capacity addition (discussed in subsequent sections), details of its original capacity is not available.

2.1.2 Absence of a defined ‘planning process’

During the study of all five assets (across the three districts) for which the planning related details are available it is seen that there was no defined ‘process’ for planning. The process was carried out by the incumbent Engineers/Officers based on their own experience. The officials expressed the need for defining simple standard checklists that could be adhered to, for the planning process to be considered complete. They suggested that DPR phase shall commence only after checking and signing on the standard checklist.

However, the officials also cautioned that adherence to checklists could be compromised by pressures to construct assets rapidly, indicating the need for random centralised checks on adherence to checklists.

2.1.3 Need for multi-year planning and budgeting

Planning needs to precede budgeting in the construction of an asset. This would mean creation of a long term (say 3-5 year) rolling plan that lists assets that are to be created/upgraded/maintained. Following this plan, anticipated sums of money needs to be made available over the same period of say 3-5 years, so that the departments can carry out their activities in line with the available budgets. And these plans would need to be made every year, in terms of rolling plans.

20³ This included three assets in Kasaragod district and two assets in Wayanad district.

During discussions with stakeholders' in-charge of various assets, a constant refrain was on revenue deficit faced by the state and resultant limitation in availability of funds. This leads to uncertainty in allocation of funds required for implementation of plans by departments for asset up gradation/construction in a year. In fact, KIIFB is now seen as the only predictable source of funding across the state.

This limited availability of funds has created a situation where stakeholders (particularly at the lowest levels of governance) are keen to execute the projects in the given financial year within the budgets allocated—because of uncertainty of future availability and allocation of funds.

The example of the Government Vocational Higher Secondary School in Delampady, Kasaragod is a case in point. The school receives from the District Panchayat a share of the Maintenance Grant earmarked for education. Any additional infrastructure required by the school is to be planned using this allocation. Since the school does not have information about long term fund availability, the school chooses to construct its assets each year with the funds made available in the given year. As a result, one can see in the photographs alongside that the school has constructed disconnected classrooms each year, as limited funds is available annually—with each new block representing funding in different years.

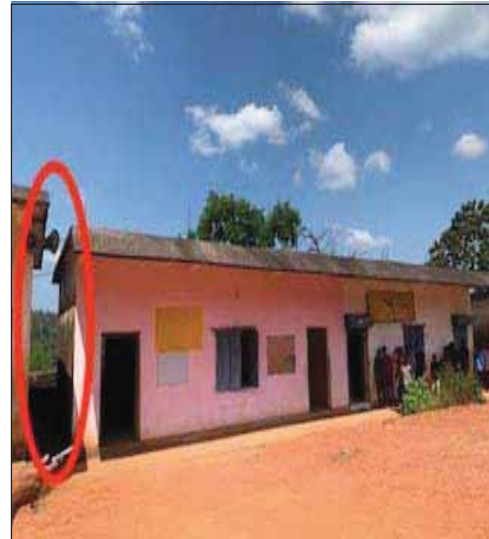


Figure 2-3: Lack of planning-GVHSS, Delampady.

A linked point for discussion along with multi-year planning is the need to look at procurement considering the life-cycle costs of an asset rather than the lowest cost method of procurement that is the norm in government currently.

The diagram on the following page is drawn based on observations during the visit to the General Hospital, Neyyattinkara, in Thiruvananthapuram district. From the diagram, implications of staggered budgets and staggered planning are clearly visible. It can be seen that the asset is constructed over many years, as would be expected— with the

growth in population and illnesses. However, disconnected nature of construction is very evident. The implication of this is that eventually, service delivery to the citizens is affected.

The diagram also brings to light an issue in the way MP LAD and MLA SDF may sometimes be used for asset construction—but do not necessarily contribute to the overall citizen needs. The diagram shows the MLA's pay ward, (shown at the top left of the image) situated close to the stores and biogas plant. The asset was constructed merely for MLA SDF utilisation. However, it is evident that in the absence of a master plan the pay ward (and all other wards, highlighted), are scattered, creating difficulties for both- patients and the hospital staff.

In the diagram below, the five storied Maternal and Child Health (MCH) block is also shown. Of the five stories, only two are presently in use due to a delay in obtaining High-Tension connectivity from KSEB. Such delays, where assets are ready for patient use, but are not put in to use for lack of utility connections needs to be scrutinised closely as it is an asset that has seen investment and has started depreciating without use.

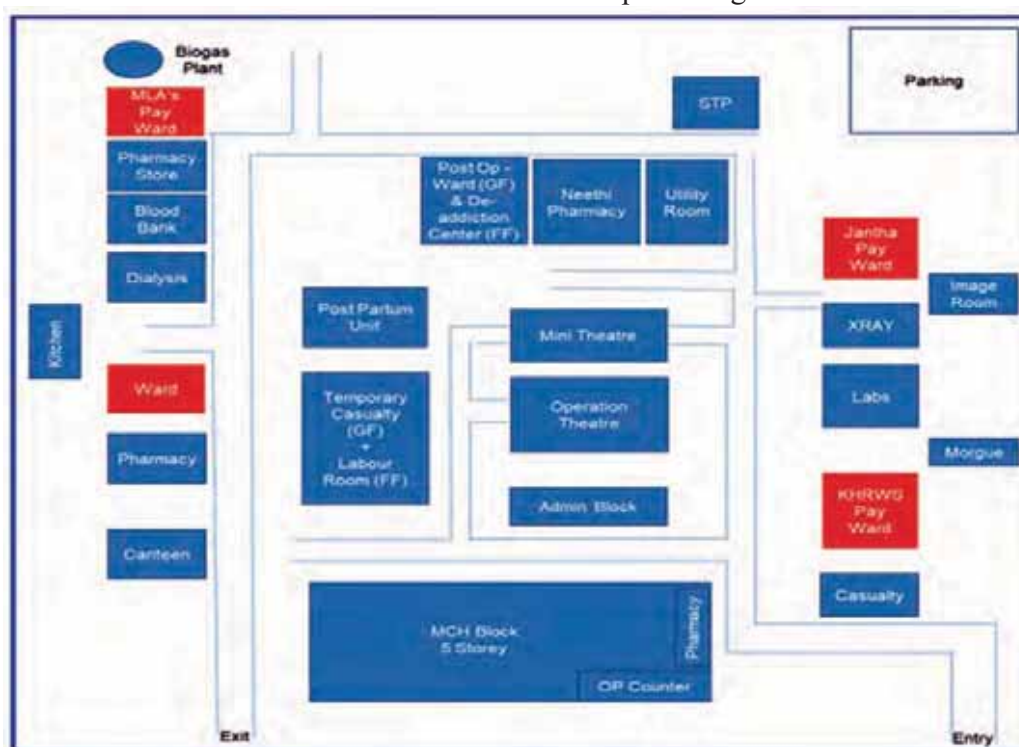


Figure 2-4: Layout of the General Hospital, Neyyattinkara - absence of a 'Master Plan'.

The diagram below is of a project recently tendered by PWD. The project is for the construction of a Taluk Hospital at Njarackal. From the diagram shown, it can be seen how the asset is constructed in phases and continues to be constructed in phases. The situation is similar to the layout of the hospital shown above at Neyyattinkara, where the MCH Block is constructed recently in the midst of several scattered blocks. While it is likely that such decision is taken based on the urgency to construct assets or the limited availability of funds, long term impact of such short-term decisions requires a considered study.

All the above mentioned cases points to the need for an Infrastructure Master Plan with adequate data of existing assets and their developmental needs. All constructions whether it is new, renovation or reconstruction shall be based on the data available in the proposed Infrastructure Master Plan.

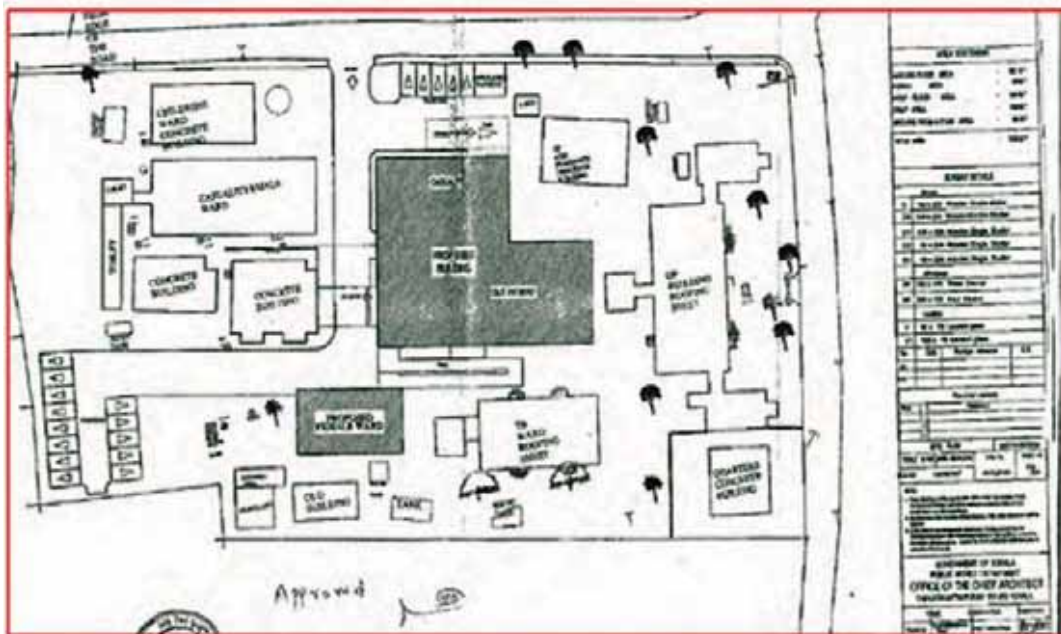


Figure 2-5 Plan of Taluk Hospital at Njarackal (from DPR)

2.1.4 Lack of document repository and standard checklists

A central repository of previously approved designs/drawings/plans and other planning literature that can be referred to by any of the engineers/designers/planners is conspicuous by its absence. In the absence of required reference material, engineers use

their own wisdom/experience during the planning process and perhaps repeat errors committed in the past. In the absence of proper documentation need arises to re-hire retired employees to locate utility lines/connections.

Process analysis of absence of documents and records reveals that this is a ‘job’ that is not defined and is not allocated to any individual in a department—resulting in the non-compilation. In a situation where transfers of officers take place as an administrative routine, it becomes more important to centrally manage such a repository.

Some of the implications of limited availability of documentation are:

- Lack of documentation is evident as in the case of assets of Primary Health Centre, Kumbadaje where the plans for construction, estimates, etc., were distributed among the District Panchayat, Gram Panchayat and the Primary Health Centre.
- In the Taluk Hospital Sulthanbathery, Wayanad, retired employees had to be re-hired in order to locate the lines of facilities such as waste water and storm water drains.
- In the case of the school (GVHSS) at Delampady it was mentioned that one reason for construction of separate blocks could be that with the transfer of Engineers and the absence of documentation, incoming Engineers preferred to construct new assets rather than build on top of existing assets due to the risks associated with such construction. It was also mentioned that in case tests need to be carried out on an existing building, the engineers would require administrative sanctions for such tests—a process that could take time. The engineers therefore choose to construct a new classroom within the same allocated time. The eventual implication of this is that single storied blocks now line the entire periphery of the school eating into the playground with each new construction.

2.1.5 Other Issues Identified

One of the questions that the ARC examined is the ‘adequacy of the assets constructed’. While adequacy of an asset can be addressed through a well-designed DPR (explained above), it is seen that in several cases, the context of an asset had changed over time. For example, the Old Age Home at Poojapura is housed within the office premises of the Social Justice Department. The initial building at Poojapura was created as a Day Care

Centre. Upgrading the centre to an old age home, where inmates stay for prolonged periods of time requires re-modelling/upgrade of the facility.

Similarly, the Neyyattinkara General Hospital was initially setup as a Taluk hospital. Today, with increasing demands from people, the hospital is upgraded to a General Hospital. As a result, additional facilities have been built but the core of the hospital design/size remains that of a Taluk hospital⁴. Such sudden upgradation of the status of a facility may not always allow for the corresponding upgradation in the infrastructure in the facility (due to space constraints or budget constraints) eventually impacting citizen experience.

2.2. Design

The design phase follows the planning phase in the asset value chain. In this phase, initial requirements gathered through discussions are converted into concrete plans, designs, and drawings by the technical/design Study team (or in-house), while taking into consideration the techno - economic aspects of the project. Outcome of the design phase is a comprehensive Detailed Project Report (DPR) which incorporates geographical factors, demographical factors, feasibility aspects, project costs, environmental considerations, project costs and other similar aspects. The DPR also serves as an annexure to the bid document that is prepared to appoint a contractor (in the next phase) and therefore needs to be a comprehensive document as it sets the base for significant investments.

Most of the assets visited are brown-field projects—i.e. they had been constructed several years back. Five (out of fifteen) assets visited are recently constructed or are in the process of being constructed and hence observations are made primarily based on the study of these assets. These observations are categorised as follows:

- 1. Shortcomings in DPRs.**
- 2. Evolving nature of designs.**
- 3. Lack of stakeholder consultation in Design phase.**
- 4. Quality and selection process of design Study team.**

2.2.1 Shortcomings in DPRs

DPR is a detailed document that captures details such as the project summary, rationale,

⁴ The team also mentioned that the sanctioned manpower of the hospital remains that of a Taluk Hospital, but the bed strength and facilities had been expanded to that of a General Hospital.

user specifications, engineering drawings and designs of main and support infrastructure, technical and financial details. DPR should also contain details of risks associated with a project, mitigating factors considered, and also, with increased attention to the environment – aspects such as sustainability. **A detailed and comprehensive DPR is therefore a good indicator of the comprehensiveness of a well-structured planning and design process.**

From the field visits, review of DPRs shared by the stakeholders, review of additional DPRs for new assets available at the Centre for Management Development, and from inputs obtained, it could be inferred that the DPR is seen as a document that is a prerequisite to obtain an Administrative Sanction explaining the urgency surrounding its completion. It is not viewed as a comprehensive document, errors in which could impact long term asset creation, use and user satisfaction. The time allocated for preparation of the DPR is close to three⁵ months (in many cases) independent of the project size, time of the year, other parameters (e.g. monsoon period may delay the DPR preparation) etc.

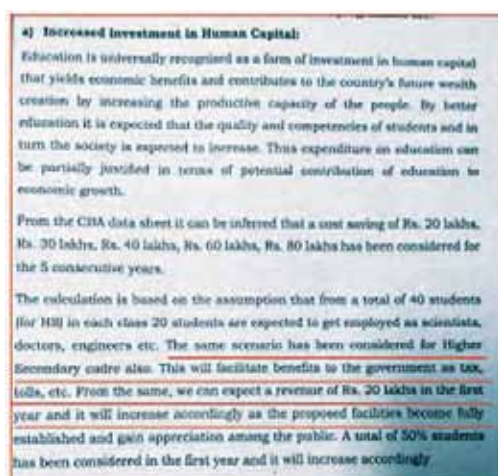


Figure 2-6: DPR – RoI computation
(as seen in the case of police stations, schools and hospitals visited), limited study of available alternative solutions and limited recommendations on the various risks and issues associated with implementation of each component/solutions and improper cost benefit analysis.

Some additional examples of findings based on the study of select set of **DPRs** are:

1. The DPR prepared for the Government Higher Secondary School,

Mogral Puthur, Kasaragod did not take into consideration factors like presence/absence of other schools in the vicinity, demographic analysis of students in the neighbourhood, past records of yearly admissions and scope for increased admissions in future.

2. Another DPR for a school that was examined, shown in the image alongside shows the method adopted in trying to estimate the ‘impact’ of the school. It is to be noted here that in some social assets such as schools, hospitals, and police stations, it need not be necessary to compute the return on investment of such assets.
3. During visit to Public Health Centre in Kumbadaje, it is seen that even though the PHC is constructed recently (inaugurated on 26-August-2019), no comprehensive DPR is prepared for this asset. DPR that was available at site is merely an aggregation of drawings. In fact, construction carried out is not in line with the designs available within the DPR (detailed in the subsequent section). This is reflective of the fact that latest version of the designs is not available with the project owner/ or that construction had deviated from designs in the DPR.

In essence, the examples provided above, and the comparison of the DPRs across various entities in the state shows that there is need for definition of minimum acceptable standard for DPRs.

2.2.2. Evolving nature of designs

Design is constantly evolving—and this could be a consequence of introduction of new standards (as in building construction or in case of quality norms introduced for hospitals), introduction of new materials (as in roads), or increased awareness of citizens/ governments to aspects of climate resilience, life cycle cost approach to projects or disability friendliness of assets etc.

Therefore, there is need for institutional mechanisms to ensure that the latest standards are adopted and implemented on an on-going basis. This is even more important for the under-mentioned organisations as they impact design and construction across the state of Kerala.

Table 1: Role in the asset value chain

Sl. No.	Name of Department/Agency	Overall Role
1	Public Works Department	<ul style="list-style-type: none"> Involved along the entire value chain of building creation for multiple departments in Kerala.
2	Local Self Government Department	<ul style="list-style-type: none"> Involved in creation of assets such as PHCs, hospitals etc. at the Grama, Block and District levels.
3	Kerala Police Housing Construction Corporation (KPHCC)	<ul style="list-style-type: none"> Involved in the creation of all assets for the police department. This includes police stations, police buildings, and residential quarters.
4	Kerala Infrastructure and Technology for Education (KITE)	<ul style="list-style-type: none"> This is an SPV of the Education department in Kerala. Funds obtained from KIIFB are routed through KITE for their use in asset creation in Kerala. KITCO is involved in the preparation of DPRs for the above projects and WAPCOS has been appointed as the Project Management Consultant (PMC).
5	Uralungal Labour Contract Co-operative Society Ltd	<ul style="list-style-type: none"> Involved in the end to end execution of several large projects including community halls, roads, bridges, buildings, parks etc.
6	Kerala State Nirmithi Kendra	<ul style="list-style-type: none"> Involved in the construction of hospitals, industrial units, parking lots, youth hostels etc.
7	KITCO	<ul style="list-style-type: none"> Involved in providing consultancy services in feasibility studies, DPR preparation, project management and monitoring works etc. to various departments in Kerala (and across India).

Detailed institutional study of PWD was done since it has a considerable impact on asset creation across the state. One of the findings is that the role of ensuring adherence to latest standards for all constructions in PWD or supported by PWD, is not defined, or allotted to any one individual—resulting in diffused institutional accountability. While PWD has a Kerala Highway Research Institute (KHRI) that is meant to be the centralised owner of such standards, this job is not done or enforced by the KHRI.

During field visits came across two scenarios about implementation of latest designs/standards:

Scenario 1: This is a case where the assets were constructed several years ago but the updated standards are issued only recently. These standards include making police stations child friendly, making all assets disabled friendly, adherence to the National Quality Assurance Standards for hospitals etc. In such cases it would be expected that all



Figure 2-7 Modifications in Taluk HQ Hospital, Sultan Bathery – for NQAS standards

the assets do not meet the above standards since the standards have been issued only recently or after the assets were created. However, it would be expected that during future renovations, such standards are adhered to.

Scenario 2: The study team also came across cases where the assets visited are constructed after notification of the standards, but still did not incorporate the standards in the designs. For example, in the Taluk Hospital, Sulthanbathery, the Operation Theatre is being redesigned to include separate doors for taking the patient in and out of the room as per National Quality Assurance

Standards (NQAS)⁶. Walls of the X-Ray room lack sufficient thickness as per standards followed in the country and are being redone to meet the standards.

There is growing awareness in the state on conserving resources, use of locally available materials, green buildings that save on power and water while reducing carbon emissions. In the DPRs examined and in the consultations with owners of all fifteen assets, these aspects are not found to receive any attention. This reflects the need for active communication and awareness creation on these aspects across the departments and among all stakeholders.

2.2.3. Lack of stakeholder consultation in the design phase

Lack of stakeholder consultation during the design phase of an asset often leads to designs which ignore needs of users of the asset. For example, during discussions with the medical team at the Primary Health Centre, Kumbadaje, it was informed that:

- a) The constructed building was not in line with the designs that are available with the PHC.
- b) Construction is not hospital friendly and has many rooms that do not serve the need of clinicians. For example, the design did not provide for wards, conference rooms, open waiting area, compound wall, ramps (now mandatory for disabled friendly assets), or separate toilets for men and women.

In the case of the Kerala Police Department, it is seen that two organisations are involved

⁶ The initial standards were brought out in the period between 2013 to 2016.

in the planning, design and construction process– Police Department and KPHCC. The Police Department (i.e. the Police Station, the District Head Quarter and the State Head Quarters) is involved in the planning and designing of police station. KPHCC is a contracting and construction monitoring agency.

During visits to police stations, several concerns were voiced about the design and construction of the police stations, inadequacy of infrastructure and the capacity of KPHCC to execute projects. These concerns were voiced by current users of the assets.

Meenangadi police station in Wayanad District is located on 6.5 cent land with a total constructed area of 241.9 sq. meters. Sanctioned strength of the police station at present is 43. At the time of construction also sanctioned strength of the police station was close to 40. However, the facilities available, availability of space, and the presence of temporarily constructed shed that housed officers, point towards inadequacy of planning process. It may also point to a situation where space available was inadequate, but a conscious decision was taken to go ahead with construction.

Overall process map shown below, shows the nature of coordination between the Police department and KPHCC:

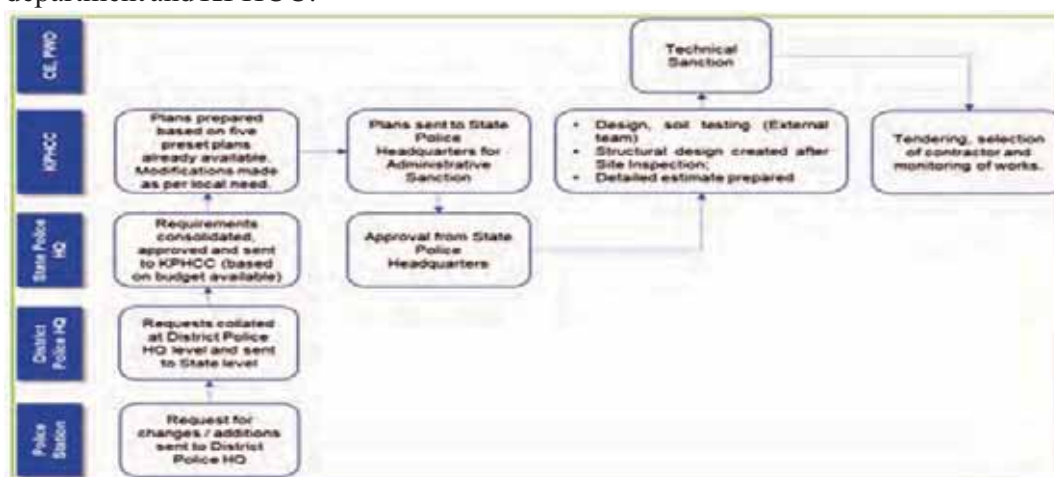


Figure 2-9: Process Map – Kerala Police Department and KPHCC interface

However, it should be mentioned that the Government Girls Higher Secondary School at Nedumangad in Thiruvananthapuram, the team found that stakeholder consultations were held. Local MLA, Head Master of the school, PTA president etc. were involved in the consultation process.

Key takeaway from the point on stakeholder engagement is that there needs to be an institutional mechanism that mandates continuous and defined stakeholder interaction. This could be done through monthly (or periodic) monitoring meetings with the participation of all agencies involved.

2.2.4. Quality and selection process of Design Consultants

During discussions with the departments, it was learned that the Government of Kerala normally follows the lowest cost (L1) method of procurement, which is historically practiced as government procurements were predominantly of ‘goods.’ Today however, there are a large number of ‘services’ that are being procured requiring a re-look at the procurement model.

In the procurement process of selecting Design Consultant for projects where design is not done by government department or agencies, there is often a need to evaluate intangibles like intellectual ability or design aesthetic that could manifest in a people friendly design of a hospital, or the use of more sustainable materials in construction, or a more engaging museum/zoo experience for children.

Government procurement process conventionally has had the need to quantify the experience of contractors as this makes evaluation simple and reduces risk of the evaluation committee. The evaluation of experience is normally done on the basis of ‘past work undertaken’ or ‘annual turnover of the contractor’—all easily quantifiable metrics. The evaluation process normally does not take into consideration ‘aesthetic appeal of a building’, or the ‘green-orientation of a contractor’, perhaps because these metrics are not easily quantifiable.



Figure 2-10 Children's Ward in General Hospital, Neyyattinkara

The above is often differentiated qualities of contractors which needs to be considered while evaluating their bids. Although the initial cost may (or may not) be marginally higher, overall impact and benefit (including intangible value) would be considerably higher. On the other hand, the negative implications of school classrooms with poor natural lighting or a children's hospital ward with poor aesthetics would be considerable.

2.3. Contracting

This phase involves drafting of Expression of Interest (EoI)/Request for Qualification (RFQ) and Request for Proposal (RFP) followed by short listing of the bidders by the administrative department. Once the bidder is finalised, the agreement is drafted and signed by both parties and Work Order (WO) is awarded to the contractor. Work plan prepared during contracting phase becomes the basis for construction, testing, and commissioning of different components of the project. Though major responsibility for implementation tasks in this phase lies with the contractor, a management process by the government needs to be in place from the outset to ensure timely and satisfactory completion of the project.

From the observations during the study common issues seen in the contracting phase are summarised below and explained in detail subsequently.

- 1. Contract documents – Techno-Commercial-Legal documents.**
- 2. L1 method of selecting contractors and overall competence of contractors.**
- 3. Separate contracts for civil and electrical works.**
- 4. Issues in contract management.**

2.3.1. Contract documents—Techno-Commercial-Legal Documents

Traditionally government implemented all its projects in-house, i.e. end-to-end of the project was done through human resources with the government. Senior officers of the government exerted 'administrative control' over the employees. The entire mechanism of project monitoring including the concept of running bills (since all purchases of raw materials used to be made on an ongoing basis), use of measurement books etc. is designed to oversee an in-house mechanism of project execution. The only external interface was the vendor(s) from whom government purchased raw

materials. This government system of project execution has undergone a sea change in the past couple of decades. Almost all projects are now only supervised by government and are executed through external contractors. The ‘administrative control’ that the government used to exert on its employees is replaced by a ‘contract’ (which is inextricably linked to the bid document). Relationship of the contractor with the government is not an employee-employee relationship but one that is singularly governed by the contract document. One of the most significant short-comings of government is its inability to modify its systems and processes to manage this ‘contractual’ relationship, manifesting itself in the form of several problems that government faces today in ensuring that projects are implemented on-time and within estimated costs.

Bid/Contract Document

A bid/contract document is a techno-commercial-legal document which defines the relationship between government and the contractor. All three aspects of the contract document are equally important.

- **The technical part of a contract defines the scope of work, standards/specifications to be followed, quality norms, work plan, procurement schedules etc.**
- **The commercial part of the contract consists of performance guarantee, payment mode, penalty for delayed execution on account of contractor’s failure, defect liability, insurance for personnel on work site etc.**
- **The legal part consists of aspects such as handling Force Majeure situations, arbitration and dispute settlement mechanisms etc.**

Observations based on the study of bid/contract documents are as follows:

- 1. Capacity to prepare a robust document:** Contract documents are predominantly drafted by engineers who have limited knowledge/training on legal and commercial aspects of a bid document. Departments have tried to overcome this limitation through standardisation of bid-documents and model bid documents.
- 2. Variations in the overall quality of bid documents:** pBid documents examined seemed to be of two types, those used by multilateral or external funding agencies (such as World Bank, Asian Development Bank and KFW) and those prepared by

the departments. Comparison of these two documents reveals variations in the quality of the bid documents- particularly in the commercial and legal aspects of the bid document.

For example, in bids prepared through funding support there is a minimum qualifying criterion and there is a technical bid evaluation scoring criteria on specific to the project while in other bids the only criteria are financial (or only mentions Category A/B/C or D contractor).

In the case of contractor selection solely based on category (A/B/C or D), the contractor classification is not necessarily linked to core sector/asset wise experience of the contractor. Also, the transition of a contractor from one category to another is based on years of experience and works executed. It does not include evaluation of other subjective aspects such as quality of work done, delays in past projects, use of innovative or new technologies, legal cases filed for non-performance etc. Frequency with which categorisation is updated also requires a more detailed examination.

In bids prepared through funding agency support, bidders are required to make presentations to demonstrate their proposal (where applicable) and qualification for the bid. The risks are more evenly distributed, and arbitrator is appointed on mutual consent (while in government bids, the arbitrator is appointed by the Government).

- 3. Absence of a work plan and dependencies:** It is noted that the contract documents specify an overall time for project completion but did not include a work plan that the contractor needs to adhere to. This work plan would normally include the hand-over date of the work order, site-hand-over date, material supply dates, construction periods, key milestones of the project and finally date of handing back of completed asset.

In the absence of work plan and dependencies in projects that involve supply of material and construction, contractor could dump material on site and collect money for the material dumped, even though many prior steps are not carried out. For example, in the case of building constructions, use of materials needs to be aligned to a floor wise construction plan. However, there are no clauses in the bid

document that link construction and supplies. This has a direct impact on cash flows of government (as more than necessary funds are disbursed), and also allows contractor to recover higher portions of project cost (as costs are normally higher for material than for labour).

- 4. Definition of project level and site level teams with job descriptions:** Bid documents⁷ of entities such as PWD have defined the profile of on site team of contractors (Clause 16 of Part III – Special Conditions of Contract) and for reviews at the Circle/HQ levels. However, presence/absence of these individuals with the said qualifications needs to be documented and tracked on a monthly basis if reasons for project delay are to be attributed to the contractor.
- 5. Continued use of running bill system:** Though works are now contracted out, running bill system is continuing as a legacy of in-house execution of work that governments used to carry out in the past. With contractors executing projects, all payments need ideally be on a milestone-based system. **A limitation of the running-bill system is that since payments are made on request-by-contractor basis and field offices are reporting project completion in percentages, there is no standardisation across field units on the definition of, say ‘80%’ completion of a project, making any kind of centralised monitoring and control difficult.**
- 6. No defined structure for monthly reviews:** It is mentioned earlier that contractor is accountable to the client through the bid document. Therefore, it needs to follow that all aspects of accountability are defined in the bid document (or a standardised mechanism of monthly/periodical reviews is put in place). Clause 76 of Part-II General Conditions of Contract (Construction Programme and Site Order Book) mentions the need for contractor to submit construction programme that requires approval of the Engineer in-chief, however such mechanisms are not stringently enforced.

2.3.2. Selection process of construction contractors

The need for moving away from the lowest cost method of selection of design contractors was discussed in section 2.2.4 above. Moving to a method of Quality and Cost Based Selection (QCBS) process for selection of construction contractors is essential. From among the various bid documents examined, one is used as an example to illustrate this point.

⁷ PWD has developed standard bid documents for works of value less than and greater than INR 5 crore.

The bid document for construction of Taluk Hospital Njarackal, floated by the PWD states that the *“The Bidder shall have successfully completed at least one similar work costing more than 40percent of the estimated cost of the work described in the NIT during the last five years”*. Both, the pre-qualification criteria and the scoring criteria specify no other requirement for the contractor to construct a hospital of a value greater than INR 5 Crore. The document also does not mention any objective evaluation of quality of drawings, designs, construction practices followed and client testimonials or even a presentation by the contractors. Changes in these selection procedures will go a long way for selection of better quality contractors.

The process of contractor selection, along with the historical mechanism of giving work to empanelled contractors of PWD, classified as A/B/C or D based on various parameters needs to be relooked. Since the number and type of assets that are now constructed is remarkably diverse, mere financial criteria and use of terminologies such as “similar works” may not be adequate. Mechanism to tighten empanelment of contractors, need to keep empanelment dynamic (rather than a onetime exercise, need to relook at contractor classification based on past performance etc., needs to be established in today’s changed context.

2.3.3. Separate contracts for civil and electrical works

One of the practices witnessed in Kerala is the issue of separate civil and electrical contracts by government departments. This is particularly true of departments like PWD where separate civil and electrical wings exist. Hence there is an institutional need to tender out projects separately even though normally electrical works constitute not more than 15-20% of a project’s overall cost. This is also because of the fact that the PWD itself has registered electrical contractors and civil contractors.

In the Government Vocational Higher Secondary School Delampady, civil works were completed (including painting, cleaning etc.) on November 29, 2019 but because of incomplete electric works, the buildings (classrooms and resting room for girl students) are not useful.

2.4. Construction

In the next phase, construction of the asset takes place as per the contract, the DPR and the work schedule. The construction phase needs constant monitoring by a project manager whose functions are clearly defined, to ensure that the plan schedules are

adhered to, deviations are addressed, and corrective action taken whenever needed. The singular Key Performance Indicator (KPI) of a project manager should be to ensure that the project is reviewed constantly and that it is completed on-time and within cost.

It goes without saying that if the DPR is incomplete (e.g. it does not capture utility lines accurately, discusses outdated technology that is not commonly used in the local conditions, surveys have not been carried out in adequate detail), or the bid document is not prepared appropriately (i.e. a poor quality contractor has been selected, or a contractor without past experience has been selected, or the scope of work is ambiguously defined) both will independently and together have direct impact on the construction phase. The above two aspects are discussed in detail in sections 2.2.1 and 2.3.1 above and hence are not repeated here.

Some of the reasons that are attributed to delays in construction phase are listed below and detailed subsequently:

- 1. Absence of a structured review process.**
- 2. Transfer of government responsibilities to contractor**
- 3. Overall project delays due to operational reasons**

2.4.1. Absence of a structured review process

The Commission emphasises that this sub-section is perhaps one of the most important sections of this report and it needs to be looked at carefully. Basis of all construction project monitoring and review processes in India is the PWD Manual, which over time was adopted by all state and central entities. It is also important because the PWD Manual, as discussed earlier, was developed for an 'in-house' construction scenario. While the manuals have evolved, they have not kept pace with modern project management practices.

Structured, rhythmic review process is the bed-rock of construction phase of any project. Systematic and consistent review as per a defined schedule (and agenda) can hold both project manager of government and the contractor accountable.

From discussions and based on an examination of project related documentation it is seen that well defined Standard Operating Procedures for conducting reviews do not exist. The bid documents examined do not mention regularity of reviews and are open

ended about the review process (unlike the quality control process for which a manual exist). As a result, reviews are conducted by the engineers in-charge based on their own experience. It is also seen that minutes of the meetings are not regularly and systematically recorded and signed by the Engineer in-charge and the contractor thereby diluting rigor of the review process. This deficiency in process would have adverse impact in of court cases (when a body of evidence needs to show that the onus of delay was on the contractor), or when liquidated damages need to be enforced.

Since the project monitoring processes are entirely offline, i.e. electronic measurement books are not used in Kerala, there is no central real-time record of project progress in the field units. Hence heads of departments are not aware of conduct/non-conduct of structured review meetings affecting or delaying their ability to intervene and resolve project delays. ***It is however mentioned that PWD is in the process of expanding the scope of the PRICE software (Cost Estimation Software) and features such as asset registers, electronic measurement books etc. shall be made available across the state shortly.***

Where reporting takes place, it is noted that all such project progress reports are in percentages. There is no standard definition of for project progress percentages, making centralised project tracking difficult.

Government Girls Higher Secondary School, Nedumangad Trivandrum, is constructed through KITE, an SPV constituted for construction of schools. During discussions with staff of the school it was noticed that the key decision makers of the school (Principal, PTA President etc.) are not formally involved in any project progress monitoring activity reducing their ownership over the construction process.

2.4.2. Transfer of responsibilities of government to contractor

Responsibility of obtaining clearances and approvals and obtaining permissions for utility shifting are the risks generally taken by the government. However, over time all departments have transferred this responsibility to the contractor. The transfer of such responsibility has taken place because of the belief that the contractor can get the clearances quicker than the government. This in essence, is an admission of the slowness of the government processes to work together to facilitate the functioning of a contractor.

Different government departments have different rules and different levels of delegation for giving permission for utility shifting. The task requires constant coordination and follows up across field level officers of multiple departments (telephone, electricity, and water etc). Linear nature of communication across government departments (i.e. through letters) rather than through coordinated committee meetings delays the process of bringing all stakeholders on a common platform to resolve issues.

2.4.3. Overall project delays due to operational reasons

While project delays are common, and could be expected, it is unreasonable delays due to operational reasons that need to be carefully examined. Two such examples that are identified are presented in this section.

The impact of such delays (in Crores of rupees) is generally not quantified and thus finding mechanisms to resolve such problems is not a priority. Through this report, an attempt is being made to put on record the extent of delays and their impact.

Government Guest House, Sulthanbathery

Government guesthouse at Sulthanbathery is constructed by KITCO. The asset was proposed to be constructed in three phases. Phase 1 was to be completed in 10 months, but was completed with a delay of 32 months. This delay was caused by delays in payment of funds by the government to the contractor. However, phases 1 and 2 are now completed. Phase 3 is presently in execution, and the timelines for phase 3 are as shown in the graphic below.



Figure 2-11 Project timelines – Government guest house at SulthanBathery, Wayanad

The delays shown above are on account of four main factors:

- Physical movement of files from office to office – resulting in a situation where once the files leave the office in which the files are created, there is no mechanism

to track where the file is (except calls to each office). Where the file is moving from a lower one to a higher one the follow up becomes more difficult due to hierarchical positioning of different levels of officers.

- b) Absence of tracking of such delays centrally.
- c) Paucity of sufficient funds or budget allocation.
- d) Piecemeal queries from hierarchical levels and delayed responses from proposers.

The guest house Sulthanbathery is almost completed. Installation of elevators, fire and safety systems and furnishings in rooms—all items the cost considerably lesser than the civil cost of the asset – are yet to be done. The rooms have however been provided with air-conditioners – which are now nearing the end of their warranty period (or the warranty period is already over). Overall result is that while considerable funds have been spent on this asset, the asset is not yet in use.

General Hospital, Neyyattinkara

A new MCH block is constructed for General Hospital at Neyyattinkara. The block is by and large complete and is awaiting an HT connection from the KSEB. As a consequence of the delay in obtaining HT connection, only two of the five floors of the MCH block are operating now as lifts are not operational. The two floors are operating on an LT connection. Initial application for HT connection was sent in the year 2013-2014 and funds were allocated in 2016-2017. But the HT connection is not provided till December 2019 when the study team visited the hospital. This indicates a total delay of over 5 years.

The hospital has expanded from one block to eleven blocks and has seven separate electricity connections – which is difficult to service in case of faults. This is now being consolidated into a single integrated connected load of 401.394 KW.

Warehouse for Election Commission, Kasaragod

The diagram on the subsequent page is self-explanatory. It identifies three cases of delays in the construction of an asset. These are delays that, in the opinion of the team that visited these locations, took place because of absence of follow up by the individuals concerned. Also, it is to be noted that even though these delays have occurred, there is no consequence or accountability of these delays on any of the individuals concerned – and therefore it is expected that such delays will continue.

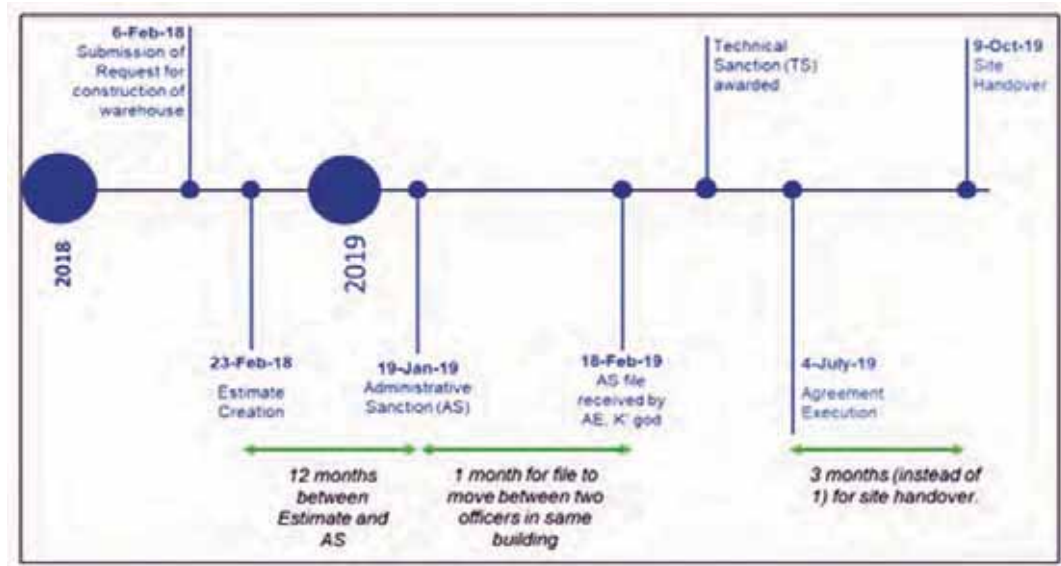


Figure 2-12 Project Timelines – Warehouse for Election Commission, Kasaragod

2.5 Quality Control

Quality Control (QC) is a critical aspect in the asset value chain. The aim of QC is to ensure that there are no defects in the finished product. Thus, it is a reactive process. An ideal quality control system needs to have basic parameters like site documents, mandatory testing of materials and works, field and regional testing laboratories, manufacturer's test certificates, departmental inspection teams, checklist for works, evaluation of the completed works, monthly reporting and review meetings. In recent times, the concept of QC is expanded to include Quality Assurance, which in essence is a quality plan along the entire process value chain.

The QC process practiced in construction works in Kerala is mainly based on provisions of G.O(Rt) No. 469/2013/PWD issued in 2013 and QC tests are made mandatory for all PWD projects since 2014. The Kerala PWD (and therefore other entities that adhere to the PWD Manual) follows a three-tier quality control system for ensuring quality of projects executed:

First-tier QC testing: In first-tier QC testing, the contractor has to carry out required tests at his own cost in a laboratory during the course of a work. It is

mandatory for all projects including maintenance and repair works, estimated cost of which is above INR 15 lakhs. The contractors are also required to setup an on-site-laboratory for work of value greater than INR 2 Crore. Tests done at site need to be signed by the contractor and the site engineer.

Second-tier QC testing: Second-tier QC tests are done by the QC wing of PWD on a random basis. Results of the tests so done are, as per the manual, recorded in the QC module of PRICE software. However, this module is not yet active and hence is not in use. Second tier tests are carried out by the District and Regional Labs of PWD.

Third-tier QC checking: In the third tier, technical audit is to be done by an external agency empanelled for the purpose, after the construction of a project is completed. Technical audit is to be done for projects, estimated cost of which is above Rs 5 crores. All tests carried out in the first-tier and second-tier QC testing shall be reviewed during technical audit. Technical Audit shall be completed within six months from the date of completion of construction.

In addition to these, third party testing is carried out by an independent laboratory whenever the contractor raises a dispute (due to differences in the test results of first-tier and second-tier testing) or when certain specific tests cannot be carried out with the facilities available in the contractor's or department laboratories.

In the assets visited, which were primarily civil structures, it is seen that the contractors submit their bills along with the QC test reports (Tier 1) to the Overseer/ Assistant Engineer in-charge of the project. The bills are processed based on the QC reports.

In one case it was noticed in file that the contractor had submitted a QC report in which only the QC ranges (as provided in the template) were replicated and the actual value of the said test (that should have been within the ranges) was not specified. It was noted that this invoice has also been cleared for payment. Such deviations reflect non-adherence to standard QC processes defined in the manual, raising serious questions about the authenticity of the QC process.

The Study team also visited the District and Regional labs of PWD for discussions on the QC processes. It was informed that these labs are presently constrained by non-

availability of drivers and vehicles and hence cannot actively carry out their inspections. It was also informed that while the guidelines specify random tests, the practice on the ground today is that, the site teams inform the District/ Regional labs about the date/ time of inspection, bringing into question the objectivity of the QC process.

Discussions with employees in these labs also indicated that significantly higher focus is required on training the lab staff on QC processes, NABL accreditation (and the expectations of NABL audit), calibration of machinery, and most importantly their adherence to the latest prescribed standards. Employees also required inputs on the test procedures and protocols to be followed as they were not fully aware of the processes. In one instance it was seen that the lab is using a banned chemical for tests and had stored the chemical in considerable quantities without an explosives license.

2.6 Operations & Maintenance

Operations and Maintenance of assets involves upkeep of the assets. Maintenance is a continuous process that needs to take place throughout the asset life and is extremely important in the case of social assets such as schools, hospitals, and government offices etc., which see higher footfalls on a daily basis. A well-maintained public asset such as a school or a police station will be one of the reasons for improvement in citizen satisfaction, improvement in the life of the asset and also public perception of government/ government facilities.

Maintenance is of two types, routine and need based:

- **Routine maintenance** is to be carried out as per a pre-determined schedule and can be done on a daily, weekly, monthly, or quarterly basis. It essentially ensures that issues are addressed in advance and higher expenses are not incurred when an asset breaks down due to lack of routine maintenance. These activities are normally carried out by the local team that is at the asset site itself.
- **Need based maintenance** is undertaken as and when the need arises- i.e. normally when there is a breakdown in machinery or when unforeseen cracks develop in civil infrastructure etc. Such maintenance activities usually require prior budget approvals (i.e. Administrative Sanctions) and are normally delegated to the department that constructed the asset.

The observations are summarised below and detailed subsequently.

- 1. Lack of routine maintenance.**
- 2. Equipment breakdown and resultant idle time.**
- 3. Delays in approvals for need-based maintenance.**
- 4. Low delegation of authority.**

2.6.1. Lack of routine maintenance

It was noted during the visits that protocol for daily/weekly/monthly maintenance activities is absent. While several complaints were heard from the asset users about the absence of maintenance and the lack of budgets to carry out maintenance activities (discussed subsequently), The Commission is of the opinion that even normal cleanliness (particularly in the kitchen of the old age homes/ children's homes visited) requires considerable improvement- indicating the absence of accountability and a monitoring mechanism for maintenance.

A notable exception to the above observation was the kitchen of the Government Children's Home, Kaniyambetta where routine inspections are carried out by the District Sessions Judge according to orders by the High Court. Officials of the institution mentioned that all maintenance activities are carried out in a time bound manner according to directions of the judge.

In offices such as Vikas Bhavan Thiruvananthapuram, which consist of multiple government offices, the difference in cleanliness between insides of the departmental offices and the common spaces is glaring. Insides of the offices managed by the departments are considerably cleaner and better maintained than the common facilities. The building is maintained by PWD and also houses a full-time unit of PWD in the premises.



Figure 2-13: Lift at Vikas Bhavan Figure 2-14: Condition of common areas at Old Age Home, Poojapura

2.6.2. Equipment breakdown and resultant idle time

Equipment breakdowns can be classified into two types—equipment breakdowns that are serviceable by the user (such as computers) and those that require OEM servicing. During visits to the assets, both types of delay were seen in the servicing of assets.

In the Taluk Office Mananthavady, it was seen that computer repairs are taken care of by the vendors appointed through the Collectorate. It was reported that there is normally a delay of at least two to three days even for taking care of routine breakdowns of computers.

Another instance of equipment breakdown was noted in the Taluk Headquarters Hospital, Sulthanbathery. Autopsy table at the hospital was functional for a while as the manufacturer had to come from Coimbatore.

In both cases, it is seen that such delays in service can go on unattended in the absence of escalation matrix. For this, a state wide asset database needs to be created followed by modification of future contracts to ensure service as per Service Level Agreements (SLAs) and finally the monitoring system needs to be strengthened. The aspect of citizen-based accountability, an extremely low cost, yet effective monitoring mechanism may also need to be considered.

2.6.3. Delays in approvals for need-based maintenance

The typical process flow for obtaining an Administrative Sanction for maintenance works is as shown below:

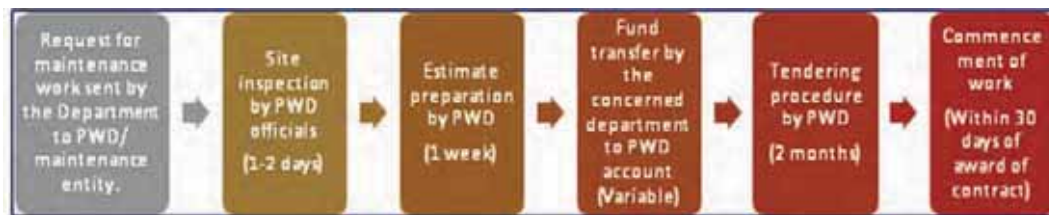


Figure 2-15: Ideal timeline for undertaking maintenance

In the figure shown above, the minimum possible time for the work to take place (approximately 75 days plus time taken for fund transfer) is shown. While these are timelines provided by the officials, the team did not come across any instance where the work is initiated within 75 days of proposal being sent.

For instance, in the case of the police stations visited, it is seen that all maintenance proposals had to be routed through the District Police Office. District Police Office

normally consolidates all proposals received before forwarding them to KPHCC. Reasons for delay are several and are listed below:

1. The line department has to follow the administrative hierarchy before the request is sent to the maintenance department (e.g. the PWD or KPHCC or others). Therefore, the file movement within the hierarchy of the line department takes time, the speed of file movement linked to the extent of follow up by the officials concerned.
2. In the case of multi-tiered organisations such as PWD, there are Circles and Divisions in its structure. The line departments sometimes sent their proposals to the Circles even though the proposals are to be sent to the Divisions, resulting in unnecessary delays- as the file is then forwarded by the Circle to the Division.
3. Due to non-adoption of e-office by the departments visited, there were instances that the study team came across, where the file is with an officer for over one month even though it is to be sent to a junior officer in the adjacent room sharing a common wall.
4. Similarly, due to non-adoption of e-office, field units often are not aware of the status of their maintenance requests once they leave their offices. A cycle of six to nine months seemed to be the norm for maintenance activities and the field units seemed comfortable with such cycles for maintenance.
5. Significant delays are seen in the provision of Administrative Sanctions by the departments themselves and also in the transfer of funds to the maintenance departments.

The cycle shown pertains to the actual time (**2+ years**) taken in one of the cases analysed:



Figure 2-16: Approximate timeline for routine maintenance

2.6.4. Low delegation of authority

Availability of funds locally with the asset owners (i.e. the delegation of authority) for

undertaking maintenance activities in different assets is shown in the table below:

Table 2: Delegation of financial authority of the Head of Institutions visited

Sl No.	Asset Name and Administrative Department	Head of the Institution	Delegation of financial powers (L1 level officer)	Delegation of financial powers(L2 level officer)
1	Old Age Home for Women, Poojapura	Superintendent	No powers to sanction any maintenance activity.	Any maintenance activity, however minor, is undertaken by PWD on request. Funds are obtained from the Social Justice department and transferred to PWD upfront. This process takes an average of 2 years.
2	Government Children's Home, Kaniyambetta	Superintendent	An imprest amount of INR 15,000 was available in order to cater to the urgent needs of children such as hospitalization, medicines etc.	Request for activities that exceed the yearly allocation are made to the department. Funds are allocated according to the number of children in the home.
3	General Hospital, Neyyattinkara	Medical Superintendent	Amounts up to INR 10,000 can be sanctioned by the Medical Superintendent (MS).	Health Management Committee (20 members) approves amounts greater than INR 10,000. Members of HMC include District Medical Officer, Citizens, Elected Representatives, MS of the Hospital, NGO representatives.
4	Taluk Headquarters Hospital, Sulthanbathery	Medical Superintendent	Routine expenses are met out of the fund available with the Hospital Management Committee.	Other expenses are made out of funds made available by the Block Panchayat on a yearly basis.
5	Police Station, Badiyadukka	Station House Officer	A permanent advance/ station contingency fund of INR 1,625 year is provided. Any amount spent from this sum can be topped-up from the DPC.	For undertaking maintenance of a higher amount, a request is sent by the police station to the Superintendent of Police (SP) who forwards the same to Police HQ in Trivandrum
6	Model Police Station, Meenangadi	Station House Officer	A permanent account of INR 1,625 provided to cater to needs of accused such as food, hospitalization etc. Most urgent expenses are met by officers themselves.	Requests for maintenance activities for higher amounts are forwarded to the District Police Chief (DPC)/ SP's Office which is forwarded from there to the Police Headquarters (PHQ).
7	Sub Registrar's Office	Sub Registrar	A permanent advance of only INR 25 is available with the Sub Registrar for contingency purposes.	Maintenance works are undertaken based on requests made to the District Registrar. Funds will be sanctioned for the same in accordance with the available funds.
8	Taluk Office, Mananthavady	Tahsildar	A permanent account of INR 5,000 is provided to fund routine expenses.	Requests for additional funds are made to the District Collector, who allocates funds if available. If funds are unavailable, the request is forwarded to the Land Revenue Commissioner at the State HQ.

Public Infrastructure

Development & Management

Sl No.	Asset Name and Administrative Department	Head of the Institution	Delegation of financial powers (L1 level officer)	Delegation of financial powers(L2 level officer)
9	Government Vocational Higher Secondary School, Delampady	Principal	Any immediate fund requirement is met through PTA fund only – into which student's parents contribute. The PTA fund is not collected from students of 1st to 8th standard. However, voluntary contributions are accepted.	Maintenance activities are undertaken using funds from District Panchayat, as per the following: Submission of request to District Panchayat. Site visit by Junior Engineer, preparation of estimate and handover to District Panchayat. Panchayat sanctions the request if funds are available. Average cycle time of 1-2 years.

It can be seen from the above table that delegation of powers in almost all cases at the L1 Officer level is limited. As a consequence, all such requests have to be routed to higher offices. During discussions, it was commonly expressed that given the process inefficiencies, the cycle for fund transfers as it goes to higher offices is of the order of at least one year, but more commonly around two years. Absence of any IT system to track file movement and fund requests means that there is no visibility across the state of such chronic issues, making even action on such matters difficult.

3. Recommendations.

The Commission's recommendations in this chapter are on steps Government of Kerala needs to take to ensure timely implementation of government projects. The recommendations are not all new and include some that are made by similar studies in the past, but not implemented. In fact, some recommendations are on issues that government departments are fully aware of deficiencies that need to be plugged. Therefore, in addition to recommending changes, the Commission is suggesting measures that are essential to ensure implementation of the recommendations with ease. Two examples are provided below to elucidate this point:

- 1. Example 1: The National Training Policy states that government departments should spend at least 5 percent of their salary budgets on training and that each employee should get at least one week of training in a year. State Training Policy for Kerala also insists for 2 percent of the Plan budget of the state to be set apart for training. Benefits of the recommendation are well known and appreciated by all. However, this recommendation is not given the seriousness it requires by the government departments. On the contrary, training in itself is viewed as a distraction from the job. It is only in the case of the Central Civil Service officers in the country that this policy is implemented reasonably well. Onus of attending these training programmes is placed on the officers by linking in-service training programmes to promotions of the officers. By embedding the training into the 'routine service of the officer' the training policy can be implemented (at least partially) in the state. (refer Commission's Second Report 'Capacity Development—Civil Servants in Kerala')*
- 2. Example 2: A similar example, closer home is that of the PRICE software that is now used across Kerala – perhaps one of the few states that have implemented such a system at scale. It is assumed by the Commission that insistence on preparation of estimates using the software as a precondition for issuing Administrative Sanctions gave it widespread acceptance. In essence, the PRICE software is integrated into the 'routine processes' of Government of Kerala and hence is accepted and used by all.*

As in chapter 1, this chapter is also aligned along the asset value chain, starting with planning/budgeting, and ending at maintenance.

Subsequent to recommendations along each element of the value chain, certain general recommendations that cut across various elements are also provided. These recommendations are included in section 3.7 of this report.

3.1 Recommendations on Planning/Budgeting

The four observations made in Section 2.1 of this report, on Planning/Budgeting are summarized below:

Sl.No.	Observation Made	Reference
1	Limited/one-time stakeholder consultations during project formulation	2.1.1
2	Absence of a defined ‘planning process’	2.1.2
3	Need for multi-year planning (rolling plans)	2.1.3
4	Lack of document repository and standard checklists	2.1.4

Recommendations to address the gaps identified in the section on as-is study are provided in this below.

3.1.1 Defining Model Planning Document

For efficient management of the planning stage of an asset two aspects need to be carried out appropriately:

- **appropriate stakeholders need to be identified and consulted once at the initial requirement-gathering stage and at least one more time when the DPRs are prepared and**
- **the planning process needs to meet certain minimum quality standard which can be ensured through a set of standardised checklists that are included in ‘Model Planning Documents’.**

In the existing planning process, outcomes of the planning process are ‘minutes of the meeting, or a list of requirements’ that merely list out expectations of the stakeholders. In comparison, an optimal planning process needs to at the least

consider several other aspects - a) actual assessment of ‘need’ for the asset, b) availability/absence of similar assets in the vicinity, c) benefits of upgrading an existing asset v/s creation of a Greenfield asset, and d) cost-benefit analysis of the asset (unless the asset is setup for public need- such as a police station or an old age home). For each of these aspects, Model Planning Documents can be prepared (if required, sector-wise) and approval of these documents needs to be made a mandatory pre-requisite to a proposal for Administrative Sanction.

At KIIFB, minutes of the review meetings are uploaded on an online platform called MISH (Meeting Information System). Minutes are accessible by all participants.

With the use of technology, it is now possible to centrally monitor all steps along the project value chain, from planning onwards. The use of simple online forms/formats, with controlled data entry fields makes it possible for all assets to be centrally tracked. It is possible, with extremely low cost IT systems, to monitor if the planning document is completed, number of signatories to the document, time taken for the planning exercise etc. While it may not be possible to intervene in all cases, it is certainly possible to take up projects on a random basis (e.g. by geography, or by sector) for audit. A team of one or more officers at the department Head Quarters can be made responsible for this routine audit. The issue today is that in the absence of any of the above data, it is not possible to make any intelligent analysis about the effectiveness of planning processes. As data comes in adequate data would be available across assets for an intelligent discussion on planning to take place.

Data Based Planning

It was heard during discussions that in several cases ‘need assessment’ are not done before an asset is proposed to be created. Often, it is an exercise on paper carried out after ‘in-principle’ decision on creating the asset is taken, usually by the elected representatives. Normally, there is limited push-back from the departmental representatives to such requests for asset creation.

Availability of data, as discussed earlier, may not immediately make decision-making totally data-backed, but would at least provide adequate, indisputable inputs for a

discussion on the ‘need’ of an asset. For example, if the discussion pertains to the creation of a School, then a geo-spatial analysis of schools, catchment area of schools, the distance that existing students have to travel to get to school etc. are data points that can be easily captured for discussion. Much of the discussion around the ‘need’ for an asset is today carried out locally without significant reliance on data backed decision making.

Introducing such a change in the planning process however would necessarily need to be driven top-down from the Government Secretaries, if more optimal planning is to be carried out.

3.1.2 Multi-year Planning

There is a general push towards creation of 3-5 year rolling plans rather than static five-year plans or annual plans as this helps in more realistic planning and budget allocations. It also allows for flexibility in budgeting process, re-calibration of budgets based on priorities and more realistic and predictable fund allocation.

A sound plan will serve as a tool for economic and financial management, accountability and also serve as a mechanism for allocating resources among different needs and priorities. Preparation of such plans as a process, encompass top-down estimation of departmental resource envelopes, bottom-up estimation of medium-term costs of existing policy and suggested interventions, and subsequent matching of these costs with available resources. The three pillars of planning can be summarised as:

- **Top down budgeting:** Finance department in conjunction with the departments uses a macro-economic framework to assess total availability of resources and identifies overall departmental share on a normative basis.
- **Bottom up estimation:** Medium-term resource needs of the department are assessed based on sector strategies and estimated costs of continuing the departmental services and cost of new identified activities.
- **Reconciliation of top down & bottom up expenditure estimates:** The gap between the top down and bottom up estimates is assessed and objectives re-prioritised to prepare annual budget of the department.

It is recognised that transition to this form of planning and budgeting is a marked change from existing systems and will require considerable commitment from people's representatives. It also requires that overall framework, once created is not considerably modified mid-plan to suit local/political urgencies as this will impact overall plans. However, with the presence of the State Planning Board, it is possible for Kerala to take the lead in transitioning to such a setup, as the Board can initiate the framework level changes required for multi-year planning and budgeting.

3.1.3 Maintaining Repositories

One aspect that was stark by its absence across the entire project value chain, across all assets visited is the absence of any logically organized repository of documents of past work done. Therefore, past feasibility studies, DPRs, reports etc. are not referred by the study team and the departments, when new assets are planned or created. In the case of government departments where retirements and transfers are a constant part of its functioning, it becomes more imperative to store all documents in repositories. Once the documents are stored, training content can be developed from these documents so that over time overall state-wide quality of planning process improves.

Associated with the above is the absence of any documentation of learning from successful and un-successful projects. In the absence of such documentation, continuous learning and improvement in systems would be limited as errors committed in one part of the state are not shared for learning to other parts of the state.

The issue in both of the above cases is institutional and process linked. The 'roles' of cataloguing deliverables and documenting best practices are undefined in government departments, perhaps because the Return on Investment (RoI) on such jobs is not visible and hence inadequate attention is paid to such roles. Similarly, in the absence of any process dependencies, both of the above roles are not carried out. It is proposed that features of the PRICE software be expanded to allow departments to store documents online, in a central repository. It needs to be made necessary to upload feasibility reports, DPRs, bid documents etc. at each stage of the process to proceed with the next stage. As mentioned earlier, as more data becomes available on an online platform, monitoring the quality of documents by the departments will become doable.

While an IT system will be a pre-requisite to ensure compliance, the Kerala State Planning Board, can be responsible for monitoring on a random basis quality of the documents uploaded.

3.2 Recommendations on Design

The four observations in Section 2.2 of this report, on Design are:

Sl.No.	Observation Made	Reference
1	Shortcomings in DPRs	2.2.1
2	Evolving nature of designs	2.2.2
3	Lack of stakeholder consultation in design phase	2.2.3
4	Quality and selection process of Design Consultants	2.2.4

Recommendations to address gaps identified in the section on as-is study is provided in this section.

3.2.1 Selecting Design Consultants of higher quality

At present selection of Design Consultants today is a purely data-based exercise in which the Design Consultants are required to present proof of past work done. The proof submitted is in the form of Work Orders or Experience Certificates. Further assessment of the Design Consultant is done, to the extent possible quantitatively, wherein statements as mentioned below are specified:

- *The consultant should have designed and executed hospital projects of at least 100 beds each in the past 5 years: For each hospital completed, 1 mark, subject to a maximum of 5 marks.*

Quite clearly, assessment of the design capability of a consultant through an assessment process as shown above would do gross injustice to Design Consultants who have, for example, gone the extra mile to make aesthetic designs, incorporate citizen-friendly aspects, focus on building green infrastructure, or promote the use of locally available/reusable materials. It would also do injustice to Design Consultant who propose materials that may lower the temperature inside the asset through leveraging on natural cooling, or those who make designs that more optimally utilise natural light—both aspects that may marginally increase the cost of the design but reduce the overall lifecycle cost of the asset itself.

ARC recommends that in the selection of Design Consultants, following changes need to be incorporated in the bidding process:

- 1. The lowest cost method of selection needs to be changed in favour of quality and cost-based selection process. 80 percent weightage to technical criteria and 20 percent weightage to financial criteria may be adopted.**
- 2. Evaluation process needs to include assessment of past designs (visuals/ cad drawings) of the Consultant, and the Consultant shall be required to present past designs and their approach to a qualified panel prior to selection.**
- 3. The panel that evaluate the bids needs to be encouraged to differentiate technical scores of the Consultant (an aspect that panels are often not in favour of doing unless all aspects of evaluation are quantitative) based on design aesthetic and approach – both subjective aspects.**
- 4. In cases where intellectual inputs are required, weightage given to the firm may be set at a threshold (say 30 percent), but greater focus needs to be on the profile of the individuals (say 70 percent) who will be involved in the project. This is suggested as selection of a larger firm only mitigates the risk, but does not necessarily guarantee quality outputs on the project. However, a careful assessment of the profiles of the Design Consultant would ensure that the quality of inputs obtained in the presentation/ approach documentation would be ensured during project execution also.**

3.2.2 Improving quality of DPRs

Section 2.2.1 lists few observations made based on a comparative study of DPRs prepared by Design Consultant appointed by different project sponsors, namely, KIIFB, KSTP and other departments. **Of the DPRs studied, KIIFB has defined and put up on its website⁹ sector-wise model DPRs that specify the chapters that need to be included in the DPR and also the content needed for each chapter. This level of detail is seen to be adequate for most assets created.** For example, the chapters specified in the DPR for Roads are as follows:

Table 3: Headings defined in KIIFB's Model DPR

1.	Salient features
2.	Executive summary
3.	Introduction
4.	Project definition, concept, and scope

⁹<http://www.kiifb.kerala.gov.in/resources.jsp>

5.	Project background
6.	Objective and scope of the work
7.	Feasibility studies (including requirement/ demand analysis)
8.	Functional design
9.	Engineering surveys and investigations
10.	Engineering design
11.	Financial estimates & cost projections
12.	Revenue streams
13.	Cost benefit analysis & investment criteria
14.	Environmental & sustainability aspects
15.	Risk assessment and mitigation measures
16.	Project management organization
17.	Contract management strategy
18.	Implementation schedule & work break-down schedule
19.	Statutory clearances
20.	Quality management plan
21.	Operations & maintenance plan
22.	Annexures

The point to be noted is that in several cases, specific chapters of the DPRs such as 15, Risk assessment and mitigation measures’ or 20, Quality Management Plan’ are chapters that are not given the importance they deserve and, in some cases, may even be replicated across similar documents. Such aspects can only be addressed through systematic reviews by a competent evaluation team and through training and capacity building of the in-house government teams that are involved in either designing or evaluating of DPRs.

KIIFB has put together teams for reviews of DPRs that include experts from outside the organisation. The experts are sectoral and are also independent giving the review process the necessary authenticity and confidence.

There is an associated point that warrants discussion with respect to DPRs and this pertains to the capacity of the in-house teams that are involved in design/ DPR preparation. Given the specialised nature of the job, frequent transfer of officials

into and from these teams would limit the ability of the design wings of departments to function effectively. However, this discussion on capacity building and transfers is linked to a larger discussion on the career paths of officials in Government and this has been discussed more elaborately in Table 5 of this report.

KIIFB has put together teams for reviews of DPRs that include experts from outside the organisation. The experts are sectoral and are also independent giving the review process the necessary authenticity and confidence.

3.2.3 Stakeholder Engagement Processes

Sections 2.1.1 (Consultation during planning phase) and 2.2.1 (Consultation during DPR stage) of this report also brought to light some of the limitations of the consultation process during the Planning and DPR phases. It is however interesting to note that while the existing occupants of the assets raised concerns about the design and its inadequacies, officers who earlier worked in the same positions and were involved in the design process, had approved the designs.

During discussions with the officers it was learned that since the budgets are available only for one year, and the cycle associated with a project is long, officers are willing to compromise on the comprehensiveness of the planning and design phases (i.e. consultations are limited) of assets knowing well the asset so constructed, may only meet part of their requirements. The Police Station at Sulthanbathery is a case in point where the design is seen to be inadequate for the sanctioned staff (even at the time of construction).

Recommendations on ‘stakeholder engagement process’ is similar to those provided in Section 3.1.1, where a Model Planning Document is proposed. Minimum expectations from a ‘stakeholder engagement process’ needs to be defined and included in the Model Planning Document itself. For example, a stakeholder engagement process could define, a) list of minimum stakeholders that needs to be consulted, b) pointers along which consultation needs to be carried out, c) minimum details that need to be captured as part of the stakeholder consultation process, d) list of points that need to be brought to the attention of the stakeholders (e.g. standards), e) local considerations etc.

While the consultation process is important and can be carried out as described above, it is equally important to do a random centralised audit of the processes. Centralised monitoring and review and its process is described in more detail in Section 3.4.

3.3 Recommendations on Contracting

Observations in Section 2.3 of this report, on Contracting are summarised below:

Sl. No.	Observations	Reference
1	Contract document – techno-commercial-legal documents	2.3.1
2	Selection process of construction contractors	2.3.2
3	Separate contracts for civil and electrical works	2.3.3

The recommendation on contracting is about strengthening of Contract documentation (and contract documentation capabilities). Observations in section 2.3.2 on selection process of construction contractors is also a sub-set of the contracting process, as the minimum qualifying/ eligibility criteria of contractors is defined in the bid-document. Therefore, this section focuses on the bid document.

In Section 2.3, it is highlighted that the contractor is accountable to the bid document and to the ensuing contract that he signs. In case of any conflict/ difference of opinion/delays etc, it is the contract document that is referred to by courts and hence the importance of the quality of this document needs to be emphasized. However, given the need to quickly initiate projects, bid document is not often given the importance it deserves.

The study came across model bid documents that have tried to allevia to this issue to some extent, however, additional recommendations are proposed below:

1. **Tender Transparency Act and Rules:** Tamil Nadu (TN) developed a Tender Transparency Act (1998, and Rules 2000) that explains in considerable detail aspects of procurement process such as bid document, sections to be included, criteria for selection of vendors, risk parameters etc. There is also a separate section on Public Private Partnership projects. In TN, procurement teams of various departments are trained constantly on the provisions of the Act. ARC recommends that government needs to consider introduction of a similar Act as it consolidates all enabling provisions in one Act making it possible for the state to carry out procurement easily.
2. **Certification process for bid process management:** While such certification

processes is not adopted by governments (both centre and state), there is a need for such certification processes. Contracting is one of the core jobs of all departments. But the employees do not receive any formal training in contracts and contract management during their entire formal education. Hence ARC recommends that the Government needs to consider certification of employees as non-negotiable at least before they are promoted to Executive Engineer (or equivalent levels).

The table below explains the problem and hence the need for training on bid documents—on technical, commercial, and legal aspects:

Table 4: Education streams and exposure to bid process management

Sl. No.	Education Stream (Most common streams selected)	Contract related learning until Class 12	Contract related learning in Under Graduation	Implication
1	Engineering (BE/ BTech)	Focus is on Physics, Chemistry and Mathematics.	Only technical aspects of Civil/ Electrical/ Mechanical engineering are learned.	No formal training on contracts in 18 years of education.
2	Science (BSc)	Focus is on Physics, Chemistry and Mathematics.	Technical aspects in the chosen subject – i.e. Physics or Chemistry or similar subject are covered.	No formal training on contracts in 18 years of education.
3	Commerce (B. Com)	Focus is on basic accounting skills and book keeping.	Introductory courses on Business Studies, Business Law included in which types of contracts and modalities of contracts are covered.	Training provided is theoretical with no exposure to a bid or a contract document made it theoretical.

- 3. Work Plan, and milestone-based payments: Contracting best practices** require that a work plan be included in the bid document that specifies the overall start and finish dates for key project steps. It is then for the contractor to submit a more detailed work plan that is in-line with the broad milestones specified in the bid. In the case of assets such as buildings, it is possible to specify in no ambiguous terms the milestones— e.g. site preparation, foundation, plinth, floor wise progress, mechanical-electrical-plumbing works, finishing etc.

The use of a work plan also allows for milestone-based payments rather than running bills. The use of milestone-based payments¹⁰ ensures that the number of bills submitted is limited, and centralised tracking of physical and financial progress is possible. KIIFB model of payments can also be adopted where the milestones are defined after issue of work order but before the first invoice is paid. Below is an image of KIIFB milestone payment screen:

Figure 3-1: KIIFB's mechanism of fixing payment milestones

Payment Milestone Label	Payment Milestone Amount	Payment Milestone Date	Payment Milestone Type	Payment Status
Payment Milestone 1- 596-80%	1717529.60	24.11.2018	RUNNING	Claimed:1717529.60 Remaining:0.00
Payment Milestone 2-596-20%	429382.40	23.12.2018	RUNNING	• -NA-
Payment Milestone 1- 1623-80%	1717529.60	10.03.2019	RUNNING	Claimed:1717529.60 Remaining:0.00
Payment Milestone 2-1623-20%	429382.40	08.04.2019	RUNNING	• -NA-
Payment Milestone 1- 1625-80%	1374326.80	15.03.2019	RUNNING	Claimed:1798442.60 Remaining:11971794.20
Payment Milestone 2-1625-20%	343599.20	13.04.2019	FINAL	• -NA-

4. **Definition of project level and site level teams with job descriptions:** Bid documents¹¹ of entities such as PWD define the profile of the contractor's on-site team (Clause 16 of Part III – Special Conditions of Contract) and reviews at the Circle/HQ levels. Entities monitoring projects need to ensure presence of these individuals, mandated by contract, on-site. This is a case where enabling rule is included in the bid document but is not enforced by the departments that tender out the projects. Enforcement can be done through a simple App based system already in use in many companies across India. The same is explained below:

The presence of engineers (of the Government and of the contractors) on site can be monitored through a simple app-based system (with GPS enablement) which works with the under mentioned workflow. This model of monitoring field presence is now common in the private sector. For example, several private

¹⁰ KIIFB ensures that, say, if a project cost if 100Crores, then no bill would be submitted for a value of less than Rs. 2 Crore. This ensures a fixed number of bills that are mutually agreed upon by KIIFB and the Contractor prior to commencement of works.

¹¹ PWD has developed standard bid documents for works of value less than and greater than INR 5 crore.

sector companies have windmills that are used for power generation. These windmills are spread across various sites and are connected to the power-grid of the state. To ensure that the meters connected to these windmills are read by the private entity's engineers, the windmills are geo-tagged and the engineers are provided with an app, which works with the following work flow:

- **Step 1:** Engineer goes to windmill location and opens the app.
 - **Step 2:** App verifies if the engineer is within the geo-tagged boundary of the windmill.
 - **Step 3:** If engineer is within the geo-tagged boundary, app requires engineer to take a photograph of the engineer's face (to ensure that the nominated engineer only is on site).
 - **Step 4:** If approved by the app, the App allows engineer to enter the meter reading on the app and save it.
 - **Step 5:** This shall be linked to the existing 'Plan Space'.
- 5. Structured monthly reviews:** Clause 76 of Part – II General Conditions of Contract (Construction Programme and Site Order Book) mention the need for the contractor to submit construction programme that requires the approval of the Engineer in-chief, however such mechanisms are not enforced. Ideally, all projects shall be monitored against this work plan and using standard templates (rather than the measurement book that was designed for use in a running bill system).

Project reviews need to follow a rhythm, the rhythm being more important than the quality of discussion that takes place in the meeting. For example, if it is decided that a review will take place on a monthly basis, then the day, time, list of attendees, agenda points for discussion etc. needs to fall into place for the review meeting. Review needs to be conducted using aggregated data collected from regular review meetings by the AE/ EE at the field level. Upward aggregation of data will ensure that the quality of review by the EE/ AE meets requirements of the review. Templates for defining agenda of a review meeting are shown in Annexure 3 of this document.

The purpose of monthly review shall be to monitor the project and also to

enable the contractor by removing difficulties that come up during project execution. Normally, in the linear file movement-based system that is embedded in the government, inter-departmental issues that require multiple stakeholders to come together remain unresolved. The monthly reviews need to include all stakeholders for resolution of issues. This will give confidence to the contractor that within a maximum period of 30 days, issues will get escalated to the highest levels in the organisation and will get resolved. Delay on account of shifting of utility lines is a typical example where multiple stakeholders need to work in tandem to resolve problems.

Here again, the KIIFB model of issuing guidelines to address the problems can be used as a basis. The guidelines are issued in G.O. (Ms). No. 444/2018/Fin dated 26-Nov-2018, Guidelines for procedure simplification with respect to Utility Shifting/Road Restoration Works.

3.4 Recommendations on Construction

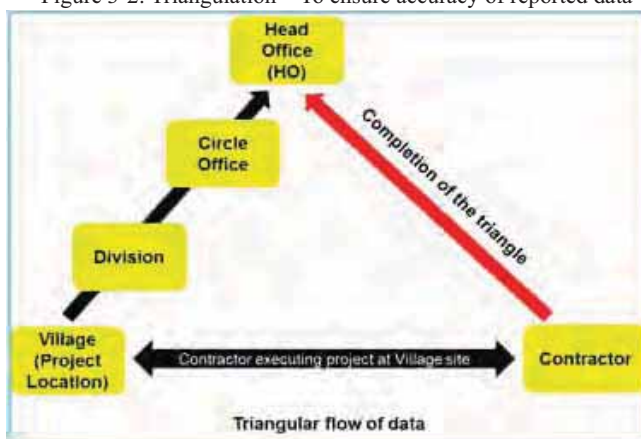
As explained in Section 2.4, the Construction phase of a project is the translation of the bid document, the DPR and other associated documents into implementation. The quality of the works carried out during the construction phase is an outcome of the rigor of the Planning (Phase 1), Design (Phase 2) and the Contracting Phase (Phase 3). Therefore, the core role of government departments in this Phase is monitoring of the construction. The mechanism for monitoring a project and the importance of the rigor of the monitoring process is explained in detail in Section 3.3 of this report. Recommendation at serial number five, of section 3.3 would apply without modification to this phase of an asset's lifecycle.

Without a monitoring mechanism that ensures escalation of all project delays to a level at which they can be addressed quickly, project delays will continue to occur. ARC recommends that an IT based centralised system of monitoring need to be adopted. It will enable officers at the field level to carry out project execution responsibilities with the confidence that delays, if any can be resolved at the monthly review meeting chaired by an officer (an officer at a Secretary level).

The diagram below illustrates the review mechanism:

In the diagram shown alongside, along the left arm of the triangle is the conventional data flow that takes place in the government system – the data is entered at the project location and it linearly flows upwards through the government hierarchy. This data flow is slow and is susceptible to manipulation since it is linear. To overcome this challenge, it is important to create the right arm of the triangle. This ensures that the data flows faster and through an independent channel. This channel can also be through the contractor or local people. The team at the Head Office will get two independent sources of information that can be reconciled, and deviations flagged. The use of technology—e.g. Apps to take photos and report them will assist in identifying delays centrally, and quickly.

Figure 3-2: Triangulation—To ensure accuracy of reported data



KIIFB's IT Processes Adopted for Construction Activities

Bill payments: The entire process of receiving and processing bills of the contractor is online. Bills generated by the contractors are sent to the SPV, which is forwarded to KIIFB. Running bills are processed in 3 days and final bills in 15 days. **An advance payment of 75 percent of the running bill is paid on the day of receipt while the remaining 25 percent is paid after detailed checks.**

Work Intimation Reports (WIR) is also submitted online through mail to the Chief Project Officer.

All details of work, from estimate preparation to preparation of DPR, its appraisal, intimation are prepared online through the PRICE software of PWD.

3.5 Recommendations on Quality Control

Quality Control is an area where rules, regulations, guidelines etc. are well defined

in the PWD manual. The rules are not cumbersome or time consuming. QC processes of KIIFB are based on inputs from the PWD manual. During the study it is noticed that challenges faced by QC is from:

- a) Lack of knowledge of field teams on appropriate QC processes and systems caused by issues noted in the induction processes of engineers (when they join their departments). Newly recruited engineers are posted for field duty as soon as they join the service succumbing to pressures to fill up large number of vacancies which cause delay in implementation of projects.**
- b) Even when officers at the field level are aware of the procedures of QC, they overlooked some essential QC practices citing time and political pressures.**

KIIFB's inspection wing conducts quarterly reviews of the work done. The wing rates the SPVs based on work quality, systems followed, physical progress and response to complaints rose in the inspection memo.

ARC recommends that QC practices included in the PWD manual needs to be implemented in letter and spirit. This will, as mentioned in section 3.4 require installation of a suitable IT solution with the following features:

- a) Allows contractors to login and raise requests for site inspections by teams of government.**
- b) Online confirmation of dates of site inspection by government officials.**
- c) Online uploading of all QC lab results, both - scanned copies and entry as editable text, to enable central monitoring and automatic flagging of deviation values.**
- d) Online approval of QC reports by officials before payment is released to the contractors.**

KIIFB has already put in place detailed QC processes that can be adopted by the

departments. Few of KIIFB's QC practices are given below.

Quality Control Processes at KIIFB

- **Auto lab:** Auto lab is a moving lab facility for on-site inspection and helps in conducting site level investigation and material testing. It uses equipment such as nuclear density gauge, rebound hammer, rebar locator, asphalt density gauge, drone, and ground penetrating radar. Most of the tests required on project sites are carried out in the auto lab itself and remedial measures are informed to the execution agency.
- **Drone based monitoring system:** Drone based surveillance systems are especially useful for projects which are complex and geographically spread over a large area. Though drone-based surveillance systems are still in their nascent stage in India, KIIFB has initiated the use of drones for design, quality, and monitoring progress of projects. Therefore, the necessary knowledge for implementing similar systems is available in the state for rapid adoption by other departments.
- **Central lab and network lab for confirmatory testing:** KIIFB has set up a central lab at their headquarters to test samples collected from field locations for material quality. It is operated by experienced quality control engineers and carries out all mandatory tests on construction materials collected from field such as sieve analysis, silt content, bitumen content, impact test etc. Specialised labs are also set up for conducting advance material testing activities.
- **Quality monitoring studio for live field visual monitoring:** Central monitoring studio with facilities for collecting, processing, and displaying real time field visuals is set up for viewing and analysing the quality and progress of the projects by senior officials at the headquarters. Auto Lab has cameras that can relay information to the HQ lab. The whole process of inspection including sampling process is recorded and transferred to the studio to avoid future disputes.

3.6 Recommendations on Operations & Maintenance

Maintenance of Government assets is an area that normally receives a lot of media attention, primarily because of the extent of interaction between people and

assets. While a lot of effort and funds go into constructing an asset, a disproportionately lower extent of attention is paid to maintenance of the assets. Maintenance of all the assets is far more important than continuous creation of new assets without provision for proper upkeep. Currently the backlog of maintenance activities has caused the deterioration of structures and most of them have to be reconstructed. It is vital to the economy of the State that timely maintenance is carried out. The maintenance activities should be properly planned and implemented periodically. For this, all the assets shall be recorded in registers and regular inspection and verification done. This shows that deterioration in the quality of assets from poor maintenance is not caused by the absence of guidelines or instructions but from issues in implementation.

1. ARC recommends that Annual Maintenance Checklists that clearly define nature of maintenance to be carried out, frequency of maintenance and the officer responsible for ensuring that maintenance is carried out as per the plan, needs to be prepared for each asset. It is to be ensured that the officer responsible carries out scheduled inspections and routine maintenance as per provisions in the PWD Manual and LSG Asset Maintenance Manual.
2. IT based review system which enables the official responsible for maintenance to ticks off boxes and certifies on a monthly basis that the checklist has been completely adhered to needs to be put into place to ensure that the officer responsible carries out maintenance as per plan. This can be supplemented by uploading a defined number of photographs to ensure cleanliness of premises and facilities.
3. It is brought to the notice of the Commission that maintenance of assets of institutions transferred to LSGIs face issues regarding maintenance. Maintenance is done by both the departments who earlier owned the assets and LSGIs who are current owners due to lack of clarity in transfer of the institutions. The Commission recommends that the ambiguity in this regard needs to be cleared and Manual of Asset Management of LSGIs (issued vide G.O (Rt) No.166/2017/LSGD dated 20.1.2017) in Kerala shall be enforced.

4. ARC recommends that one of the departments in office complexes like Civil Station/Public Office/Vikas Bhavan needs to be given the responsibility of monitoring and coordinating maintenance/housekeeping. This shall be decided by the District Collector.
5. Empowering People: People can be easily involved and empowered through IT solutions that allows them to photograph or video record complaints and share it with a centralised government call centre/MIS centre (the complaints can also be segregated by department and made available to each Secretary). Once the complaint is logged into the system, a ‘complaint registration date’ becomes known. Compliance of the complaint is again the responsibility of an officer at the field level, who will address the complaint and close the complaint on the IT system. This system is the default system that is being used by all private service providers (D2H, telecom, consumer durables etc.). The closure report filed by the officer can then be verified through a random IVRS based system where audit calls are made to the persons to verify if they are satisfied with the complaint. The entire system can be run at an extremely low-cost using technology.

The interesting aspect to note with respect to maintenance is that the government has defined a good pre-monsoon inspection practice for bridges. These inspections (and therefore maintenance) activities are carried out annually by departments such as PWD. It could be that given the criticality of the bridge (over a building) and the implications of failure that such assets are given the priority they deserve but other assets, such as government buildings, are not.

6. Centralised listing of Social Assets and engagement with Corporate: One of the alternatives that could

Annual Building Inspection Checklist		
Facility Exterior	YES	NO
Is the building address or identification clearly visible?		
Are exterior lights in working order?		
Are the exits onto public streets free from visibility obstructions?		
Are all building sides accessible to emergency equipment?		
Does the building appear to be in good repair?		
Are exterior walls free from cracks or other damages?		
Are windows free from cracks or broken panes?		
Are painted surfaces inspected and repaired (i.e., lifts, cracks, etc.)?		
Are stairs, landings and handrails in good repair and fastened securely? (inspect the bottom of each step)		
Are facilities periodically inspected and documented?		
Are all sewer clean out caps in place?		
Are all irrigation covers in place?		
Do entrance doors close slowly to avoid hazards to fingers?		

be explored considering resource constraints is the engagement with Corporate for CSR funds. GIS based listing of all social/public assets across the state needs to be taken up rapidly and this information shall be made available to all the people in the state. They can then contribute through an online mechanism for maintenance activities.

The same can also be done through engagement with socially oriented organisations such as Rotary International, Lions Club etc. These clubs are normally present in various cities and they are required to take up social projects annually. It is seen that in many cases these organisations do not have visibility of the assets in their localities or are unaware of the need for maintenance support services. Aggregating these organisations (which have state presidents) and helping them channelise their funds may also be explored.

This option was discussed with the Superintendents at the assets visited— as existing rules allow the Superintendents to proactively seek (rather than wait for) such funds. However, absence of motivation and the absence of any system for recognising extra work done are some of the reasons given for lack of interest in such proactive steps.

3.7 Cross Cutting Recommendations

In this report, a problem-solution approach is adopted in identifying gaps in the asset value chain and in making recommendations. An attempt has been made to link the recommendations to specific challenges identified. However, in addition to the one to one problem-solution approach adopted, there are also larger thematic issues that need to be redressed. These are mostly cross cutting in nature and needs to be addressed for sustainable impact. Few such recommendations are given in **table-5** and primarily concern aspects of human resource management.

Table 5: Cross cutting recommendations

Sl. No.	Problem	Problem description	Solution
1	Leveraging technology	<ul style="list-style-type: none"> Decision making in the government has not leveraged on technology and with multi-tiered structures that are geographically dispersed it is extremely difficult to track file movement. With rapid increase in asset construction, and therefore assets in use, it is necessary to track these assets, their location, land documentation, and their condition. Without technology, it is no longer possible to track all the assets. Projects, which are now the mainstay of government capital investment, are constructed without use of technology by the government – while larger contractors that the government is working with have moved to these technologies. There is a need to adopt basic systems such as electronic measurement books, asset management modules etc. Employee related aspects- such as leave tracking, reimbursements etc. can be largely automated with lower cost IT systems, but legacy pen and paper systems (even without pre- 	<p>It is recommended that the following four modules are implemented at the earliest to address delays identified in this report:</p> <ul style="list-style-type: none"> E-Office Asset Management System (including Asset Register, and GIS mapping of the Asset) Project management module ERP for HR and Finance.

Sl. No.	Problem	Problem description	Solution
		defined templates) continue to be used. This means that even employees are required to follow up on their dues – a responsibility that should solely rest with the administration.	
2	Strengthening of HR departments in all government departments	<ul style="list-style-type: none"> • The HR function in governments is equated to ‘administration’ and therefore is staffed by individuals who come from the cadre of administration staff— LDC, UDC, Section Officers etc. While this cadre is suitable for administration (i.e. Human Resource Management), aspects such as skilling, career and succession planning, job rotation etc. are specialised aspects that require expertise (as they fall under the domain of Human Resource Development). • Even basic aspects like forecasting the number of retirements, number of potential promotes, and filling of vacancies avoiding stagnation of employees are not being implemented because of absence of skills. 	<ul style="list-style-type: none"> • Introduce HR as a specialised cadre in all departments. Human Resource Management can be carried out by the existing administration staff. However, for HR Development aspects, professionals need to be inducted into the system.

SL No.	Problem	Problem description	Solution
3	Induction training and subsequent in-service training not given adequate importance	<ul style="list-style-type: none"> • The low importance given to training of government employees is in actual fact the consequence of a linked issue. • Given the constant freeze and un-freeze in the recruitment of human resources, there is a recurring situation where a large number of employees retire in a short span of 3-5 years and then there is an urgent need to fill these positions in a short time. • Because of the urgent need, the induction training is compromised, and employees are posted in field locations without induction training. • This matter is not given the priority it requires as government do not have a system to quantify the impact of a less-skilled engineer (e.g. through delayed contracts, poorly written RFPs, cost incurred on account of legal cases etc.). 	<ul style="list-style-type: none"> • As in the case of Central Civil Service Officers, the training at various points in their service should be made a pre-requisite to promotions. (ARC's second report on 'Capacity Development of Civil Servants in Kerala' may be referred.) • Allow for deputations and sabbaticals only if minimum training requirements are met. • Also, project management training and financial training (e.g. the impact of working capital on the business of a contractor) shall be made mandatory in training modules. The government also needs to examine incentivising its employees to join Project Management Professional (PMP) and Certified Financial Analyst (CFA) certification programmes for its employees and provide faster promotions to those who acquire these certifications.

Sl. No.	Problem	Problem description	Solution
4	Large recruitments as a knee jerk reaction to large retirements (a vicious circle)	<ul style="list-style-type: none"> As explained in the point above, the large numbers of vacancies are filled through an equivalent large recruitment resulting in stagnation of employees in their posts in the long term. This reduces their promotion opportunities, creates disparities between employees who joined in the same year etc. 	<p>The solution is provided through an example:</p> <ul style="list-style-type: none"> Consider a situation where 100 vacancies are created in a short span of time and these need to be filled. First, agree to fill these 100 vacancies through regular human resources over a span of 3-5 years. This is a onetime activity that, though difficult, will need to be carried out to set right poor recruitment practices that have been followed for many years. Fill about 30% of the vacancies through regular human resources, 30% through contract resources and 30% through deputation (Excel computations can be done for accurately predicting the percentages). Remaining vacancies maybe filled through appointments of interns, re-appointment of retired workforce and appointment of apprentices. Over the 3-5-year period, replace temporary appointments through regular appointments in a phased manner so that the vacancies are filled, and new recruits do not stagnate in the future. (ARC in its 3rd report 'Personnel Reforms have recommended changes to be made in the recruitment process.)

Sl. No.	Problem	Problem description	Solution
5	Recognition of good performance	There is no existing system in government to recognise employees who go over and beyond their normal call of duty, but at the same time, risk taking is disincentivised.	<ul style="list-style-type: none"> • Create simple systems to recognize good performance of an officer (or of a team). The inputs can come from citizens, peers, superiors and can be collated through IT systems. Issue certificates of merit for good performance. • Monetary rewards may also be built into the system, if required, although government appetite for such monetary incentives has traditionally been low. • ARC's second report on 'Capacity Development of Civil Servants in Kerala' may be referred.
6	Absence of a performance-based promotion system and existence of a complicated Annual Appraisal Format.	<ul style="list-style-type: none"> • The onus of justifying poor performance is on the Reporting Officer and hence the Officers are not keen to rate their subordinates poorly—resulting in the continuation of the seniority based system of promotions. 	<ul style="list-style-type: none"> • Introduce simple metrics at Division and Circle level for measuring team performance. • The metrics can include 'citizen feedback', on-time completion of projects—all of which can be easily quantified and scored. This takes away the need to 'justify' poor performance. • The ACR forms essentially need to address a) Technical capability on current job, b) Behavioural competencies on the current job, and c) Potential—so that the individual could be considered for promotion.

Sl. No.	Problem	Problem description	Solution
			Simple 1-2-page forms can be designed for the above assessment simplifying the cumbersome long forms (7-8 pages ¹²) that are currently in place. (Also refer to ARC reports on 'Capacity Development of Civil Servants' and "Personnel Reforms".
7	Transfer of employees delinked from their competencies	<ul style="list-style-type: none"> • In all departments there is a need for a small, but highly skilled workforce that is involved in aspects such as DPR preparation, design approvals, knowledge of latest standards etc. • In existing government rules, transfer can be done purely on administrative grounds creating situations where inadequately skilled individuals are posted in such roles. 	<ul style="list-style-type: none"> • Engineers need to be incentivised for posting in design wings, training centres or similar jobs as is the practice in countries like China. • Specific posts in the departments need to be designated as 'critical' posts (or some equivalent nomenclature) and tenures of officers in these posts need to be for longer periods and protected through suitable modifications in rules. • Transfer process need to be digitised and justified • Reason for transfer shall be specified.

3.8 Prioritisation and Implementation of Recommendations

This section on prioritisation of recommendations is included as a guide to the Government for rolling out the recommendations. The table below includes parameters such as cost of implementation and complexity of the change suggested to arrive at the proposed priority for roll out.

74 ¹² https://keralapolice.gov.in/media/pdf/forms/kp-forms/confidential_report_gazettedofficers.pdf

Table 6: Proposed prioritisation for roll out of recommendations

Sl. No.	Element of value chain	Recommendation	Cost of roll out	Complexity of implementation ¹³	Proposed roll out priority
1	Planning	• Defining a model planning document (3.1.1) that lists out the steps, and an acceptable outcome for the planning process	Low	Medium	High
2	Planning	• Multi-year planning and budgeting process – introduction of three-year rolling plans (3.1.2)	Medium	High	Low
3	Planning	• Maintaining repositories of data throughout the project lifecycle (3.1.3)	Low	Medium	High
4	Design	• Improving quality of Design Consultants through a more rigorous selection process (3.2.1)	Medium	Medium	Medium
5	Design	• Improving quality of DPRs by defining sector wise model DPRs with table of contents (3.2.2)	Low	Medium	High
6	Design	• Stakeholder engagement process throughout the project value chain (3.2.3)	Medium	High	Medium
7	Contracting	• Certification of Engineers on completion of course on Bid Process Management (3.3, Pt. 2)	High	High (will take time to implement)	Medium
8	Contracting	• Work plan and milestone-based payments (3.3, Pt. 3)	Low	Low	Medium
9	Contracting	• Definition of project level and site level teams with job descriptions (3.3, Pt. 4)	Low	Low	Medium
10	Contracting	• Introduction of structured monthly reviews with standard templates into the bid document (3.3, Pt. 5)	Low	Medium	High
11	Construction	• Introduction of structured monthly reviews with standard templates (3.4)	Low	Medium	High
12	Quality Control	• Strict adherence to QC processes already written in the PWD manual and IT enabled reporting of test reports-scanned reports and editable values	Low	Low	High

¹³. Either due to time taken or scale required to be achieved

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Sl. No.	Element of value chain	Recommendation	Cost of roll out	Complexity of implementation ¹⁵	Proposed roll out priority
13	Operations and Maintenance	<ul style="list-style-type: none"> Use of daily, weekly, monthly, quarterly checklists with online monitoring (3.6, Pt. 3) 	Medium (IT system required)	High	High
14	Operations and Maintenance	<ul style="list-style-type: none"> People empowerment (including through Kudumbashree Units) to report on maintenance quality of assets (3.6, Pt. 3) 	Medium (IT system and advertising required)	High (Needs to become a movement)	High
15	Operations and Maintenance	<ul style="list-style-type: none"> Engagement with corporates locally for CSR funds for asset management (3.6, Pt. 4) 	Low	High (Existing employees will need to be aligned to this process)	Low
16	Cross cutting recommendation	IT modules to be implemented: (3.7, Pt. 1) <ul style="list-style-type: none"> E-Office Asset Management System (Asset Register; GIS mapping of the Asset) Project management module ERP for HR and Finance. 	High	High	High
17	Cross cutting recommendation	<ul style="list-style-type: none"> Introduce HR as a specialised cadre in all departments. (3.7, Pt. 2) The Human Resource Management can be carried out by the existing Administration staff. However, for HR Development aspects, introduce professionals into the system. 	Medium	High	Low
18	Cross cutting recommendation	<ul style="list-style-type: none"> Induction and intermediate training during the career of employees – with training being a mandatory pre-requisite for promotions. (3.7, Pt. 3) Incentivise Project Management Professional (PMP) and Certified Financial Analyst (CFA) certification programmes for its employees and according them faster promotions in case they acquire these certifications. 	Medium	Medium	Medium
19	Cross cutting recommendation	<ul style="list-style-type: none"> Planned recruitment and promotions with no ban on recruitments at any point to fill vacancies. (3.7, Pt. 4) 	Low	High	Low

Recommendations.

Sl. No.	Element of value chain	Recommendation	Cost of roll out	Complexity of implementation ¹³	Proposed roll out priority
20	Cross cutting recommendation	<ul style="list-style-type: none"> • Introduction of non-monetary rewards-based systems to recognize good performance. (3.7, Pt. 5) 	Low	Medium	Low
21	Cross cutting recommendation	<ul style="list-style-type: none"> • Simplification of ACR forms (to 2 pages), and introduction of quantifiable performance management system, where ratings can be communicated to the employee without hesitation, as at least 60-70% of the score is quantifiable. (3.7, Pt. 6) • System should begin in quantifiable jobs, such as project completion (on-time, within cost) – e.g. CEs in Engineering departments 	Low	Medium	Medium
22	Cross cutting recommendation	<p>Stable tenures, at least for some critical posts (3.7, Pt. 7):</p> <ul style="list-style-type: none"> • Specific posts in the departments can be designated as 'critical' posts (or some equivalent nomenclature) and the tenures of officers in these posts can be made longer and protected through suitable modifications in rules. • The transfer process also will need to be digitized and detailed justifications given for initiating transfers, • Engineers can be incentivised for posting in design wings. 	Low	High (Since it requires political will)	Low

PART-2

Road Infrastructure

4. Roads

Roads have a significant role in the economic progress of a nation. Kerala, the southernmost state of India spread over 38,863 sq. km is located between latitude between 80 18' N and 120 48' N and 740 52' E and 770 22' E. Kerala has a network of 11 National Highways, 72 State Highways and many district roads. Exponential increase in vehicular traffic, varying climatic conditions etc., gives rise to recurring issues in the maintenance and construction of roads and road intersections in Kerala.

First part of this report has dealt in detail approach and methodology of the study based on Asset Value Chain. Most of the issues cited in Part 1 are applicable to Part 2. There are also few issues that are specific to construction and maintenance of roads.

Planning, construction and maintenance are the main stages of road projects. Requirements at various stages of implementation of these stages are:

4.1 Planning

4.1.1 Need Analysis

Need analysis forms the basis for planning complementary economic and social services that will maximize the benefits of greater population mobility. Before approving a road project, requirement for the project needs to be established by facts and figures. Currently need analysis for most projects, including for mega projects is either not done or is done based on obsolete or non-updated data. Needs analysis is essential for the prioritisation of infrastructure projects and enables phasing. Project approval without need analysis is a difficult task and tends to be subjective and amenable to external influences. Personal influence plays a major role leading to disparity in infrastructure development. This is evident at many locations in Kerala with over development in certain areas and limited/curtailed development in other areas. It is also seen that even some of the projects executed through borrowings do not have proper need analysis.

4.1.2 Network plan

A common concept in road network planning is the structuring of roads depending on the function of the road. Roads with a high share of through traffic connecting distant or important places have a different function from urban main roads or urban access roads. This leads to the necessity for function-specific network densities and design characteristics. In network planning transport planners determine the form of a network by assigning a function to a road which then influences road design and add new network elements. Chaotic traffic and bottlenecks are the result of lack of network planning. A good example is the Kollam bypass planned in 1970s and opened for traffic in 2019 without giving required attention to changes that occurred between design and completion of the project. In the changed traffic scenario lack of attention given to connecting/intersecting roads/design of junctions are causing large number of accidents, most of them fatal.

4.1.3 Prioritisation

Prioritisation of projects based on a rigorous selection model, with clear and effective criteria is essential for efficient utilisation of scarce resources. Project prioritisation and selection can be optimised against four dimensions: absorption, impact, legitimacy, and capacity, and six corresponding requirements: efficiency, effectiveness, clarity, fairness, transparency, and capacity. State government's current design and implementation strategies often leaves room for improvement, as reflected by the lack of strategic direction in allocating funds. It is essential to enhance efficiency and effectiveness of proposed investments for maximizing impact in the background of inherently limited availability of financial resources. Getting the priorities right is vital for a sine-qua-non condition for allocation of limited financial resources. The prioritisation of projects can be achieved only if need of a project is established.

Currently there is a lacuna in the identification and allocation of funds to primary projects in the state. This results in allocation of budget for tertiary or secondary projects while primary sector projects are starved of funds.

4.1.4 Detailed Project Report

DPR is the final, detailed appraisal report of a project and a blueprint for its execution and eventual operation. In other words, DPR is a very detailed and elaborate plan of a

project indicating overall programme, roles and responsibilities, activity time frame, resources required for the project, possible risks with recommended measures to counter them and sustainability. Cost estimate is a part of the DPR and gives financial requirements of each item in the project. As mentioned in part 1 of the report a detailed and comprehensive DPR is a good indicator of the comprehensiveness of well-structured planning and design. DPR also serves as an annexure to the bid document that is prepared to appoint a contractor and therefore needs to be a comprehensive document as it sets the base for significant investments.

Currently projects get administrative and technical approval without proper investigation and designs, based on cost estimate which is only one of the items in the DPR. In most cases DPRs do not reflect risk assessment and mitigation measures or issues of sustainability. Hence implementation is often unstructured and unscientific.

Stipulation of standards/guidelines

Indian Road Congress (IRC), Bureau of Indian Standards, Ministry of Road Transport and Highways (MoRTH), Ministry of Rural Development (MoRD) etc have postulated standards/guidelines for planning, design, construction, and operations of roads in the country including specification of materials to be used. Any activity connected to roads need to follow these standards/guidelines and any deviations needs to be justified with reasons. This is strictly followed in the construction of National Highways, PMGSY roads etc. These standards/ guidelines are not strictly adhered to in most road projects in the state and road construction activities are often carried out without DPR. Most of the time reasons given for deviations and omissions are frivolous and major reason raised by the authorities is difficulty in land acquisition. Compromises done at this stage are irreversible and may not be rectifiable in future due to increase in population and rise in land prices.

The standards to be followed on the different components are as follows. Detailed design standards are at **Annexure 5:**

a. Geometrical Design guidelines for roads

Road designs and construction are done on the basis of categorisation of roads into National Highways, State Highways, Major District Roads, Other District Roads and Village Roads and by considering design traffic, design speed, stopping sight distance,

terrain of land and cross-sectional conditions. Along with this it is necessary to consider design traffic, design speed, stopping sight distance, terrain of land and cross-sectional conditions.

Vattappara, a major accident spot along NH 66 located 26 km from Valanchery in Malappuram district is a typical example of deficiencies in geometric design standards resulting in major accidents. Most of the crashes occurred due to over speeding while manoeuvring the sharp curve which is in a downward gradient and resulted in overturning of vehicles into the valley side of the curve. This indicates a possible deficiency in the horizontal geometric provided at the curve. The geometry of the curve was not adequate to ensure a smooth manoeuvring of the traffic flow. As part of the improvement proposal, the all curves in the 0.5 km radius are proposed for improvement to meet the design standards. The design speed adopted along the project road varies from 40kmph at the normal stretch to 20kmph at the critical curve location. Vertical geometry was improved to a design speed of 40kmph throughout the road stretch. In order avoid the reconstruction of pavement, vertical geometry is kept in line with the existing profile to the maximum extent possible. All vertical curves shall comply with the criteria of stopping sight distance. The curve radius at the accident spot location is increased to provide a smooth manoeuvring flow of traffic along the curve. Also, two curves before and after the critical curves are introduced for reducing the speed at critical curve. The existing two-lane road at the curve is improved to intermediate/2 lane movement separated by a New Jersey type barrier. This will guide the vehicle drivers to follow the lane discipline which in turn avoid the possibility of head-on collision. Transition curves as well as the super elevation at the curve location are duly considered as part of the improvement proposal. The proposal measures complying with the standards suggested by IRC codes was partially implemented and showed a substantial decrease in accidents. The suggestions resulted from a scientific study are still implemented partially.

The Adoor – Kazhakkootam road stretch is a typical example for a design compromises and how the compromises can result in accidents. The road stretch, part of State Highway-1 bears the significant regional traffic movements characterized by sharp horizontal curves, vertical curves, lack of sight distance and many access roads close to vulnerable locations. The road stretch is designed

for a speed of 65 kmph. Vertical geometry at many portions of the road stretch does not comply with the design speed of 65 kmph. Also, at many portions the vertical geometry does not comply with the criteria of stopping sight distance. Sharp horizontal curves without adequate radius of curvature and transition length make the corridor unsafe for drivers. Absence of requisite retro-reflective signs, and visible markings, lack of retro-reflective studs, absence of street lighting, significant shoulder drop, unscientific design of intersections and bus stops etc. add to the issues. Based on the crash data analysis, a total of 85 accident black spots are identified in the 80 km road which is a testimonial to the fact that inadequate road design is a major factor for road accidents in addition to lack of discipline in driving and road use.

b. Side drains

Side drainage needs to be designed according to IRC SP 42-2014. Proper functioning of pavement depends on a well-maintained drainage system. One of the reasons for frequent damage of bituminous pavements is lack of proper drainage facility. The provision and maintenance of drainage on both sides of roads are important while considering the life of the pavement.

c. Road markings

Road infrastructure includes signals, sign boards, road markings etc. According to IRC 35-2015, specifications for road markings of various utilities are suggested on technical basis. These include longitudinal markings, markings at intersections, markings at hazardous locations, word messages and object markings.

d. Speed breakers

Roads are designed for a certain design speed to meet the mobility requirement. At some locations speed control may become necessary. To ensure that the posted speeds are maintained, control measures known as traffic calming measures are provided.

Design guidelines for speed breakers are to be carried out according to IRC -99 2018. They are installed to provide visual, audible, and tactile stimuli which can alert driver to slow down. They are of different dimensions and are chosen according to the type of traffic.

e. Signs and Signals

Traffic signs and signals provide valuable information to drivers and other road users. They represent rules that ensure safety, communicate messages to drivers and pedestrians that helps to maintain order and regulations and reduce accidents. Design guidelines for road signs are based on IRC 67 2012 and are incorporated in the Motor vehicles Act. Noncompliance of road signs, signals and markings with concerned standards and specifications is a major cause for increase in road accidents.

The Oachira- Parippally Road stretch of National Highway 66 was a highly accident-prone stretch. From investigations it was found that over speeding and rash driving of vehicles are major causes of fatal accidents on the stretch. In addition, it was found that absence of poor retro-reflective signs, less visible markings, lack of retro-reflective studs, absence of street lighting, unscientific design of segregated bus stops etc also caused accidents. Road markings and signages provided did not comply with relevant Indian Roads Congress (IRC) standards. Edge line marking and centre line marking were not visible. pTraffic signages were installed years ago and had lost its retro reflective property. All these clearly highlight the importance of road signs, markings and signals complying with relevant standards and specifications, in significant reduction of road accidents.

f. Standards for Intersections/Junctions

Intersections are an important and critical element of a road section. Importance of intersection or junction design is that efficiency, safety, speed, operational cost and capacity are directly related to junction design. Main objective of junction design is to ensure safety, convenience and comfort of road users while minimising potential conflicts between vehicles and pedestrians. The design of an intersection needs to ensure safe, smooth and efficient flow of traffic. Design principles followed to achieve this include uniformity and simplicity of design, minimisation of conflict points and safety factor in designing intersection.

Alankode junction in Trivandrum district, a staggered intersection is a typical example of how unplanned space for commercial activities in the vicinity of an

intersection and inappropriate signal design causes traffic delays and accidents. There should be proper planning to consider safety factor in the design of intersections.

g. Parameters of Intersection Design

Intersections are designed considering flow, distribution and future growth of traffic. Separate designs need to be specified for each site considering physical conditions, land cost, construction cost and effect of the project on the neighbourhood. It is important that proper planning is done in advance for space needed for traffic signs, traffic lights, drainage, public utilities etc.

Important parameters of intersection design that affect intersection capacity are- speed design, traffic volumes design, radius of curvature, visibility, use of traffic control devices, road markings, signs and signals, reflectors, spacing, lighting and drainage, right of way etc., at intersections and special consideration for spacing in urban areas adopting IRC standards.

Chamravattom Junction in Ponnanni Municipality, Malappuram district of Kerala is a five-arm intersection in Kanyakumari-Panvel National Highway (NH66, Old NH 17). NH 66 crosses Edappal-Ponnanni Road at this junction and Ponnanni-Tirur Road originates from this junction thus forming a five-arm intersection. Ponnanni-Tirur Road meets National Highway at acute angle making the junction a complex one in design. Accident rate observed at this junction is alarming. Widening of NH66 which is a two-lane undivided road to four lane divided road at the junction and providing a link road about 150m from the junction for connecting Kozhikode arm and Tirur arm will improve the capacity and flow of traffic to a great extent.

h. Junction design compromises

Compromises are often made in the design of junctions to minimise land acquisition and avoid hardships to land/building owners. But these compromises often lead to road blocks and accidents. An example is the Adoor high school and bypass junction at the intersection of NH 183 and Kayamkulam-Pathanapuram road.

Junction design compromises:

Adoor high school and bypass junction is situated at the intersection of NH 183 and Kayamkulam-Pathanapuram road. A comparison of both long term and short-term proposal clearly shows the compromises done in the design due to shortage of land. The long term and short-term proposals are shown below.

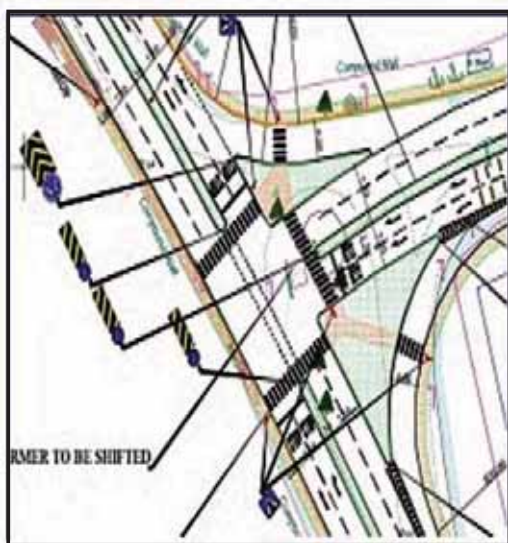


Fig 4.1: Long term proposal of Adoor high school and bypass junction



Fig 4.2 Short term proposal of Adoor high school and bypass junction

The long-term proposal suggests a right of way of 20.5 m with 3.75 m standard lane width, 1.5 m shoulder and 2 m footpath cum drain. But the short-term proposal has a lane width of only 3.5 m and shoulder width 1 m. In the long-term proposal, the zebra crossing for pedestrians is provided but this is absent in short term proposal. Also, there is no provision for drainage in the short-term proposal.

i. Design of bus bays and Bus stops

The importance of designing bus bays and bus stops is neglected in most road projects. Proper designing of bus ways and bus stops can reduce congestion and conflicts on the roads to a great extent. Bus stop designs are to be done under IRC 70: 2017. Another reference is KMBR- Kerala Municipality Building Rules for design of bus shelters and waiting stations/bus stops.

4.2 Utility plans

Fast growth in transportation, communications and energy networks have led to several intricacies in the evolution of networks. Networks include highways, railways and waterways at surface level, subways, pipelines and cables below the surface, communication lines and electrical lines above the surface, and wireless communications systems. As networks grow, the possibility of two or more networks occupying a common right-of-way or intersecting each other will increase. As a result, construction, maintenance, and operations of one network affect the others.

Each road authority has the responsibility to maintain right-of-way of highways within its jurisdiction and preserve operational safety, integrity, and function of road infrastructure. The manner in which utilities occupy right-of-way(RoW) of highways can materially affect safe operation, maintenance, and appearance of the highway. Hence it is essential to regulate/authorise use and occupancy of utilities.

4.3 Construction and Implementation

4.3.1 Activity Plan/ Flow Chart

Project Management Institute (PMI), defines ‘Project Management’ as “the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality and participating objectives”. Project planning is a fundamental and challenging activity in the management and execution of construction projects. It involves choice of technology, definition of tasks, estimation of required resources, time taken for individual tasks and identification of interactions among the tasks. A good plan is the basis for preparing budget and schedule of the work. In addition to these technical aspects of construction, it may also need to include organisational decisions about relationships between project participants and selection of organisations to be included in a project. For example, the extent to which sub-contractors will be used on a project is often determined during planning construction.

Activity Plan/Flow Chart is absent in most of the projects funded by state government and leads to laxity in control and inordinate delay in implementation. Lack of effective monitoring is the main reason for delay in implementation of many projects, often for trivial reasons.

Time and cost overruns have significant economic and social repercussions. Delays in project implementation lead to delays in delivery of goods and services to the people from the projects. Services provided by infrastructure projects serve as input for other sectors, and cost overruns in these projects lead to an increase in the capital-output ratio for the entire economy. In brief, delays and cost overruns reduce efficiency of available economic resources, limit growth potential and reduce competitiveness of the economy.

4.3.2 Quality of Construction and Materials

Quality of construction materials is important for ensuring sustainability of civil infrastructure. Major reasons for premature failure of road pavements is the use of substandard materials and poor construction techniques rather than over loading and environmental influences. Quality checks required for the commissioning of road projects specified in guidelines/codes are often neglected/relaxed in the state.

Quality Control (QC) is a critical aspect of the asset value chain. Essential requirements of QC are explained in Part 1 of this report. Appropriate and effective system to assess and screen quality of material and prevent adoption of substandard construction techniques is essential to ensure quality and longevity of road projects. Quality control requires not only knowledge of material characteristics but also confidence in handling and testing the materials, correct interpretation and timely delivery of test results, and familiarity with construction techniques.

Road failure is every year phenomenon in the state and reason for failure is attributed to heavy rains. At the same time, there are examples of roads constructed under stringent conditions on quality of construction and quality of materials performing better in the same weather and is durable. Kazhakkootam-Adoor stretch of Main Central road, funded by World Bank and constructed adhering to quality norms, is an example.

4.3.3 Accountability

Accountability of officer in charge of every activity in construction/maintenance of road assets is a pre requisite for ensuring quality of the asset. Transfer/relocation of officials in the midst of a project diminishes accountability and the possibility of identifying persons responsible for defects in construction. Premature failure from use of inappropriate construction methods, poor quality materials and faulty equipment etc, are the outcome of lack of responsibility of the official in charge.

4.3.4 Human Resources and Infusion of Technology

Road infrastructure in Kerala is maintained by various agencies—Public Works Department (PWD), LSGIs, Irrigation department, Forests department etc. Other agencies involved in the road sector are National Transportation Planning and Research Centre (NATPAC), Motor Vehicles Department, KSRTC, Roads and Bridges Development Corporation of Kerala (RBDCK), Kerala State Transport Project (KSTP), Kerala Road Fund Board (KRFB) and Road Infrastructure Company Kerala (RICK) Ltd. Effective monitoring and supervision are basic needs for ensuring quality and adherence to standards in construction and maintenance of infrastructure projects. Most of the agencies in the construction sector face constraints in the adoption of technology, and availability of human resources with required skills.

4.3.5 Enforcement

Accuracy in designing traffic volume is crucial for durability of pavements. Adoption of designs of lower volume for higher volume of traffic has serious impact on the life of the pavement. It is observed that trucks are loaded heavily which leads to an axle load which is higher than the design figures. These heavily loaded trucks damage and reduce life of the pavement. It can be seen that there is laxity in the adoption of proper traffic volume designs and enforcement of regulations.

4.4 Maintenance

4.4.1 Maintenance protocol

Road maintenance is essential in order to (1) preserve the road in its originally constructed condition, (2) protect adjacent resources and user safety, and (3) provide efficient, convenient travel along the route. Unfortunately, maintenance is often neglected or improperly executed resulting in rapid deterioration of the road and eventual failure from climatic and vehicle use impacts.

Operation and maintenance activities can be characterised as reactive, preventive, or predictive. Preventative maintenance is planning in advance to systematically perform activities that generate longer term, efficient operation from the entire system of the infrastructure. Reactive maintenance is the unscheduled repair of infrastructure components when it breaks down and when responding to user complaints. Predictive

maintenance is the process of performing analytical activities such as structural and functional analysis that detect and remedy problems which cause failure and is most often used in the road sector.

Maintenance is often neglected or improperly carried out in the state resulting in rapid deterioration of the road and eventual failure from both climatic and vehicle use impacts. At present there is no effective system for timely maintenance of roads. Contractors' obligation for maintenance is only 3 years for new road constructions and 1 year for surface renewal. After this period condition of the roads start deteriorating in the absence of regular maintenance. Potholes formed during the monsoon season are not repaired immediately. No arrangements are made to divert the stagnating rain water and this result in quick development of potholes and causes extensive damages to the road surface. Huge expenditure is incurred every year for the repair of such damages to the roads. If potholes are repaired as soon as they are formed, extensive damages to the roads can be avoided and there by huge expenditure to the Government on this account can be saved. Timely repair of potholes will also help in reducing road accidents and damages to the vehicles.

4.4.2 Encroachments

Encroachments on roads, pavements and public land adversely affect lives of the people, purpose of the road, reduce right-of-way and are a reason for accidents.

A system of zero tolerance to illegal constructions, viz statues of public figures, religious structures, commercial establishments, and residential structures etc. by encroaching government land, especially roads, is essential.

4.5 Other Road related issues

4.5.1 Street lighting

Street lighting is absent/improper in most of the roads in Kerala. Even where street lighting is available, quite often it is poorly designed and inadequately maintained (e.g., there are large numbers of burned-out lamps), and uses obsolete lighting technology—consuming large quantities of energy and financial resources, and often fails to provide high-quality lighting. This causes several accidents that could be prevented if proper lighting is provided. Installation of street lights in in the state is currently done without any scientific study. Quality of lighting elements, lighting

requirement, energy efficiency, height of lighting, lux etc. is not considered while installing street lights. Only few roads in the state are properly lighted. Best example for proper lighting is Trivandrum city roads constructed and maintained by Kerala Road Fund Board KRFB) through Trivandrum Road Development Company Ltd (TRDCL). Quite often, street lighting is poorly designed and inadequately maintained (e.g., there are large numbers of burned-out lamps), and uses obsolete lighting technology—thus consuming large amounts of energy and financial resources, and often fails to provide high-quality lighting.

When designing or making changes in street lighting, it is important to understand light requirements of the road. Street lighting in India is classified in the Indian Standard (BIS, 1981), based on the traffic density of the road. Based on the classification in the code, the local engineer matches the category of road and designs and provides installation specifications for the street lighting system.

4.5.2 Avenue plantation

Roads shall not be looked upon merely as a means of transportation. It is an integral part of the physical environment and socio-economic milieu. Loss of vegetation is one of the unavoidable consequences of road development. Planting trees along the road sides, highways and pathway is known as avenue plantation. Avenue plantation is generally practiced for aesthetic value, for providing shade, control of soil erosion and for economic use of timber, flowers and fruits.

Land needed for avenue plantation and landscape improvement is not usually considered in the preparation of land acquisition Plan for road projects foreclosing the possibility of planting trees on completion/or alongside the road construction. Most of the time tree planting, if done, limits intended functions of footpath and earthen shoulders.

4.5.3 Access control

Kerala has the unique phenomenon of urban continuity with minor differentiation between rural and urban areas which implies ribbon development all along the roads. Ribbon development along the roads has led to various human activities along the roads that severely impact travel speed of vehicles. Higher degree of urbanisation has led to concentration of commercial activities on urban roads, attracting huge volumes of

vehicular traffic which creates ripple effects on all adjoining road corridors. Maintaining design speed of the roads is required to avoid excessive delays in traffic. To maintain design speed on the roads and to avoid unreasonably high delays on the road, accesses to roads needs to be limited by providing parallel roads, proper designing of junctions and strictly maintaining suitable building line.

4.5.4 Parking

Absence of provisions for parking and resultant parking on streets reduces road width and causes traffic congestion. Regulations and guidelines for parking need to be followed according to parking management policies under each district planning authority. For each city, the provisions will change as per the availability of space and properties of traffic.

4.5.5 Interdepartmental coordination

Existing systems for coordinating activities of departments that utilise roads for various activities have proved inefficient in preventing damage to road surface. Even newly built/maintained roads are often dug up by utility providers. After completion of works related to road digging, each road layer removed is not replaced in the order in which it is to be replaced. This causes sudden and severe damage to same locations, repeatedly.

It is observed that majority of roads in the state, apart from encroachments face dumping of waste. Landscaping of the sides of the road will, improve aesthetics, ensure safety and assist in keeping the roads clean.

Most of the roads in the state are congested due to inadequate width. Financial constraints prevent government to widen existing roads to ease the congestion. Almost 80 percent of the congestion is at junctions as free left turn cannot be provided due to narrow width of the road.

Absence of way side amenities like hygienic toilets, eateries, charging points etc., cause hardships to road travellers, especially during long road journeys.

KSEB's transformers, RMU's and BSNL's junction boxes are often located on the sides of the roads, endangering the public. Despite direction of the Hon.High Court of Kerala to KSEB to relocate its transformers from road by acquiring land, they are reluctant to

comply with the order due to the difficulties faced in identifying alternate locations and cost involved in land acquisition.

4.5.6 Shortage of Raw materials

One of the major problems faced by the construction industry in Kerala is shortage of raw materials, especially granite stones and sand/ manufactured sand. Environmental concerns have led to the closure of many quarries and stone crushers and many are facing closure from depletion of the natural resources. Hence, adoption of technologies that limit use of these materials is essential to prevent, escalation of cost of materials essential for construction industry to survive, delay in completion of large infrastructural projects including widening of National Highway from Kasaragod to Parassala etc. Several recyclable materials are currently used in civil engineering applications. These include tyre shreds, ground tyre rubber, fly and bottom ash, blast-furnace slag, steel slag, cement kiln dust, silica fume, crushed glass, reclaimed asphalt pavement (RAP), and rice husk ash. Reuse of these materials is beneficial in civil engineering applications that require large volume of materials. Use of recycled materials in place of conventional materials will preserve the environment, natural resources, optimise energy use and expensive and/or potentially harmful waste disposal is avoided. Other countries have moved ahead on recycling technologies especially on RAP. Recycling and use of RAP needs to be promoted. PWD has done a project in Alappuzha in 2018-19 with Cold Recycling Technology and the same is being run successfully. Hence Government shall promote use of RAP in the construction of roads.

4.6 Part 2- Recommendations

4.6.1. Planning

1. ARC recommends that need analysis needs to be a prerequisite for approval of any project. The necessity of each project proposal needs to be justified. Information regarding future traffic, direct and indirect benefits of the project, beneficiary classes, possibility of phasing, economic development opportunities, traffic congestion/environmental benefits etc needs to be specified. Need analysis of projects will assist the funding authority to prioritise projects and ensure justifiable fund allocation through transparent process.

2. In network planning, transport planners determine the form of a network mainly by assigning a function to a road which then influences the road design and

then add new network elements. Hence, a network plan is essential for each area and the development needs to match the network plan.

3. In order to improve the efficiency and effectiveness of fund allocation prioritisation of projects needs to be done at planning stage and implementation shall be based on the decided priority. Prioritisation assumes more importance in the case of projects funded by KIIFB and other agencies/institutions using borrowed money.

4. No projects can be effectively implemented only with the cost estimate. DPR is a final, detailed appraisal report on the project and a blueprint for its execution and eventual operation. All projects shall have DPR, and project sanction needs to be based on the DPR. Deficiencies in DPR can be addressed through systematic review by an evaluation team with competence in project planning and management. ARC recommends that inhouse teams of departments involved in design and evaluation of DPR, needs to be capacitated and given training in preparation of DPR.

5. Guidelines and standards for road projects are developed through rigorous research of many years by many experts and needs to be adhered to. Hence a culture needs to be developed in the state that any infrastructure related activities shall strictly follow relevant standards and guidelines and any deviation without justifiable reason shall be held accountable.

Advance preparation of utility plans and providing dedicated area/ducts for utilities in the right-of-way itself is needed to avoid frequent road cutting/digging and road blocks. Action needs to be taken to relocate utilities to specified locations within the ROW before each road improvement/widening work starts. Government needs to ensure that utilities are not provided underneath road pavement or the shoulder, in future works. Some of the utilities already laid under the pavement may be relocated to the edge of the RoW. Constant efforts from the road authorities are required to shift the utilities from the middle of the road to the edge of the area dedicated for utilities.

ARC recommends that government shall develop a digital platform for coordinating and monitoring related activities by all concerned agencies.

Coordination of all related agencies needs to be ensured by government to prolong the life of roads by avoiding digging of roads immediately after completion of road construction/road improvement. Concerned officials shall be held accountable for lack of coordination and failure in monitoring.

4.6.2 Construction and Implementation

1. Compared to many states, projects located in the southern states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu, have experienced shorter delays and lower cost overruns. However, government needs to ensure better activity planning as it is an essential requirement for all public infrastructure to achieve desired results and to ensure accountability in government expenditure. Quality checks required for commissioning of road projects as per guidelines/codes are often neglected/relaxed. In order to ensure durability and sustainability of roads, quality as per MoRTH specifications needs to be adhered to during construction. Suitability of materials for construction of each road needs to be analysed/critically examined as quality of material required varies with design/parameters. Officials responsible shall be held accountable for any deviation/laxity in quality checks. Quality checking needs to be incorporated as an essential component of DPR and payment of bills shall be linked to results of quality check.

ARC recommends that government needs to evolve systems to ensure accountability of officials for defects in construction that reduce quality of construction, and sustainability and durability of the asset constructed.

Constraints/insufficiency of personnel for monitoring and supervision of projects diminish quality of the projects and cause delays. ARC recommends to government to overcome the issue of shortage of human resources through, restructuring of technical cadre of the departments, process reengineering, increased use of digital/IT solutions and adoption of latest technologies in the construction sector.

Traffic studies need to be a condition precedent to arrive at design traffic volume with accuracy to avoid adverse impact on the life of roads by adoption of designs of lower volume for higher volume of traffic. Limiting values needs to be stringently enforced to eliminate overloading of trucks and resultant damage to roads.

4.6.3 Maintenance stage

Annual and periodic maintenance needs be done to sustain and prolong life of pavement and to eliminate repeated and frequent damage to same locations in roads. The pavement can withstand varying climates only if there is proper maintenance.

ARC recommends that government needs to consider entrusting to the construction contractor maintenance of newly constructed roads/after renewal of surface, for at least five years. Amount required for repairs after the guarantee period shall be included in the estimate. Government may also consider inclusion in the estimate amount required for repainting of dividers, footpath kerbs and handrails after 2 years of construction/maintenance. This will help in reducing cost of repairs and maintenance of roads and ensure safety.

Stagnation of rain water on the roads results in faster development of potholes. Necessary arrangements need to be carried out for timely diversion of rain water during the rainy season to prevent formation of potholes and for quick repair of potholes to prevent extensive damages to roads. PWD and LSG Engineering departments needs to be provided equipments required for the purpose including vehicles fitted with customised cold mixing patching system.

Maintenance as seen in City Road Improvement Projects in Thiruvananthapuram and Kozhikode shall be arranged for all major roads in the state on contract basis for 5 years including sweeping, removal of waste, encroachment etc. Permission can be given to the residents' associations and commercial establishments in the vicinity incorporating conditions for up-keep and maintenance.

ARC recommends that political interests and religious sentiments shall not be an acceptable reason for preventing eviction of encroachments as eviction is often blocked by them. Evictions need to continue throughout the year and a clear message shall be spread among the public that encroachment of government land is illegal and is punishable. Primary responsibility for eviction of encroachments needs to be on the officer in charge of the infrastructure. She/he should issue notice for removal of encroachments and inform police and revenue authorities in case of any objection or dispute.

4.6.4 Other Issues

- 1. Properly designed, energy-efficient street lighting system provides visibility for people to travel in safety and comfort, reduce energy use and cost, and enhance appearance of the neighbourhood. Conversely, poorly designed lighting systems can lead to poor visibility or light pollution, or both. For proper designing of new lighting schemes, it is important to consider appropriateness and effectiveness of energy efficient street lighting technologies and systems for different situations. Street lighting technology and design decisions needs to be based on meeting local lighting requirements while achieving maximum energy efficiency. Most importantly, the design of a street lighting system must be appropriate for the site and provide the level of illumination (lux) and uniformity of light specified in the Indian Standard (BIS, 1981). Decisions about lighting systems also need to consider relative importance in each situation of lamp efficacy, good colour rendering, and light distribution of different types of lamps.**
- 2. ARC recommends that government needs to formulate a policy for street lighting to improve driving conditions on the roads and to avoid/minimise road accidents.**
- 3. To improve aesthetics of the roads, provide shade and prevent soil erosion it is essential to promote avenue plantation. ARC recommends that space required for avenue plantation needs to be included in the road cross sections and due importance given to avenue plantations in the DPR to ensure availability of sufficient width for avenue planting. Avenue Plants which are suitable for Kerala condition shall be identified and planted.**
- 4. In order to maintain speed on the roads at the design speed and to avoid delays, access is to be limited by providing parallel roads, proper designing of junctions and enforcement of suitable building line. Government needs to consider access control, to begin with, at least on selected roads.**
- 5. Government needs to formulate schemes for providing sufficient parking space to minimise congestion on the roads. Newly built shopping complexes in congested areas need to provide sufficient space for parking. Provision of either on street or off-street parking needs to be ensured in each city otherwise the widening of city roads is ineffective as evident in Trivandrum city.**

6. Avoiding/eliminating congestion of roads as a result of insufficient width of the pavement needs to be addressed at the earliest. Without waiting for acquiring land to widen full length of the road land can be acquired for widening major junctions/intersections for 50-75meters to facilitate free left traffic. In addition to acquisition value, owners of the building or land so acquired needs to be incentivised through reduction in property tax for the remaining part of the building/newly constructed building.

7. To reduce hardships of travellers government needs to promote setting up of wayside amenities along major roads, with toilets, phone charging facilities and food stalls. Entrepreneurs willing to associate with the activity may be given concession in building rules and Paddy& Wetland Conservation Act etc., and selection shall be through a transparent process. Other concessions can be given to the investors to make these small businesses profitable. Ox-bow lands formed as a result of straightening of roads are suitable to provide such amenities.

8. Relocation of transformers, RMU's and junction boxes is an urgent requirement to ensure safety of the people. Constructing concrete pedestals on the footpaths/sidewalks and placing KSEB and BSNL units on the pedestals will be a remedy for this problem. Cost for construction of pedestal for KSEB's transformers is only around Rs.40, 000. (Six such pedestals have been set up already in the Calicut improvement Project).

9. ARC recommends that government needs to address the issue of shortage of construction materials, especially of granite stones and sand/ manufactured sand, faced by the construction sector. Environmental concerns lead to closure of quarries and crushers and aggravate the issue. Use of large quantity of depleting natural resources for construction of roads is not a sustainable option. Use of recycled materials and reuse of construction demolition waste will help in reducing adverse impact on the environment and in preservation of natural resources.

Two examples for recycling/reuse of materials are:

I) Milling old surface of road and resurfacing with materials so obtained:

Recycling of existing black topped surface of roads taken up for renewal of surface will help in reducing demand for granite and its variants. Government needs to

decide that all future resurfacing of Proads will be done only by milling existing surface and utilising the materials so obtained for resurfacing the road. This can save around 30 percent of materials. Cost of BC resurfacing after milling will be less than for providing new BC layer. The only additional equipment required for this is the milling machinery which costs between Rs. 1 crore/Rs.3.25 crore depending on the width of machine. Contractors will invest in required machinery once Government permits such works for resurfacing.

ii) Recycling of Construction Demolition Waste:

Construction demolition wastes from dismantling of structures are dumped without exercising any control on its disposal. This in turn endangers the environment and destroys agricultural lands. ARC recommends that Government shall encourage collection of demolition debris and recycling the same after crushing. Crushing of old concrete debris can produce manufactured sand and granite metal etc. It can also be used for producing base and sub-base layers of road formation-Granular Sub-base (GSB) and Wet Mix Macadam (WMM). Pavement blocks and many other items could be produced from the recycled materials. Incentives like tax deduction/holidays, lending of government excess land for setting up crushing plants etc., may be done to promote use of demolition waste. Units of high/medium capacity need to be established in the private sector or through PPP mode.

PWD has done a project in Alappuzha in 2018-19 with Cold Recycling Technology and is running successfully. Government needs to promote use of Reclaimed Asphalt Technology (RAP) and other innovative technologies like perpetual pavement, pavement recycling, warm mix asphalt, Cement Grouted Bituminous Macadam, Precast Concrete Pavements etc., in Kerala roads.

PWD manuals need to be amended to include provisions for adoption of innovative technologies, use of modern equipments, promote recycling/reuse of construction materials etc.

Roads are the arteries through which the economy of a nation pulses. Construction and maintenance of roads, junctions and associated facilities follows an engineering procedure and standard specifications. It can be concluded that majority of issues

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associated with roads and road junctions arise from unplanned commercial spreading, lack of awareness about road signals and markings, insufficient dimensions of carriageway, right of way etc, lack of strict enforcement of law for traffic violations, lack of road drainage facilities etc. Majority of transportation issues can be eliminated/resolved through adoption of specifications/standard/procedures suggested by IRC codes, along with provision for future development and strict enforcement of traffic laws. Road asset management system needs to be implemented in the Public Works and Local Self-government departments for effective management of road assets.

PART-3

Infrastructure- Development and Management.

5. Infrastructure—Development and Management

Part 1 of the report examined issues related to construction and maintenance of social infrastructure in the state through a life-cycle approach and Part 2 issues in road infrastructure. Issues in infrastructure development, financing, and management of assets across public infrastructure including ports, highways, airports, metro services, dams etc are discussed in Part 3.

5.1 Master Plan for Infrastructure Development

A master plan is a ‘land use plan focused on one or more sites within an area that identifies access, general improvements and needed infrastructure, and intended to guide growth and development over a number of years and in phases.’ The purpose of a Master Plan is to promote growth and guide and regulate present and future development of towns and cities. According to ‘Planningtank.com,’ “It is an instrument to work out land and infrastructure requirements for various urban and rural uses, and allocate land for various uses to result in harmonious and sustainable distribution of activities so that towns / cities are provided with a form and structure within which they can perform all their economic and social functions efficiently and effectively. The purpose of a Master Plan is to promote growth and guide and regulate present and future development of towns and cities with a perspective of 20-25 years”. A master plan is prepared based on inputs from the public, physical, social and economic characteristics of the selected town/place, existing development, survey of the land and includes analysis, recommendations, and proposals for population, economy, housing, transportation, community facilities, and land use of a place.

Most of the Infrastructure development projects in the state, whether large or small is not implemented as part of a long term plan or vision. Processes followed for formulating infrastructure projects are usually opaque and the prime stakeholders viz the people who are intended beneficiaries of the project have no say in the need of the project or is aware of its benefits. The Commission views that infrastructure development in the state needs to be based on a master plan.

Master plans are usually prepared for a period of 20 to 30 years. Along with the master plan, an implementation plan also needs to be prepared and strictly enforced. Yearly

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review of master plan is needed to factor in required changes. Any deviation or updating shall be based on the recommendation of a group of experts constituted for the purpose and approval of government.

The Master Plan needs to be based on requirements of the state in key infrastructure and social sectors, develop a strategy on infrastructure development and identify projects to be implemented during the validity period of the master plan. The following are the tasks associated with the preparation of IMP:

- Identifying and developing thrust areas, sub-strategies, and a work plan for growth.
- Identifying critical pipeline of projects in key sectors and profiling of projects. There will be Infrastructure Development Master Plans for various sectors like agriculture and allied, transport, social infrastructure- health, education, office buildings, etc.
- Assessing demand supply gap and projecting future requirements.
- One-to-one meeting with Secretaries/HODs of concerned departments, LSGIs, heads of PSUs, Statutory Boards and other implementing agencies and private sector stakeholders.
- Study current development scenario of Kerala with reference to Kerala Perspective Plan 2030 and other planning/policy documents to identify gaps and project future requirements.
- The consultant shall identify focus sectors, sector strategies and sub strategies.
- The IMP document must describe following items for each sector:
 - Brief description of the sector: National and State scenario.
 - Demand-Supply position and future requirements.
 - Shelf of projects, with brief profile of each project.
 - Investment requirement, total, sector wise, project wise.
 - Prioritise the projects for implementation.

- Identify land availability for infrastructure development.
- Identify sources of natural resources for construction.
- Prepare an action plan, for five years and for the Master Plan period of projects to be implemented through public funding and / or extra budgetary resources.
- The action plan needs to be prepared considering:
 - Analysis of budgetary allocation in each sector in past five years.
 - Possibility of significant extra-budgetary investments in infrastructure.
 - Identify Projects likely to attract Private Sector Developers.
- Identify requirement of Government resources for the identified projects. Alternative financial structures for each major project for five year shelf of Projects may be evolved across sectors and in consultation with Government Departments. This should form a basis for the five year plan from 2022-23. Annual plans for infrastructure development need to be subsets of the Master plan.
- Suggest suitable alternative mechanisms for raising of funds in addition to government funds.
- Suggest comprehensive and holistic implementation strategy for the proposed action plan.

5.2 Infrastructure Financing

Development of essential infrastructure is crucial for, improvement of social and economic sectors of the state, improve service delivery, and meet rising aspirations of the people. The State faces constraints in resource allocation through budgetary resources for investment in infrastructure. Capital expenditure in the State as percentage of GDP is less than 2 per cent across years.

Table 7- Trend in Capital expenditure in Kerala, 2002-03 to 2017-18, Rs in crore.

	Total Expenditure	Capital Expenditure	Capital Expenditure of as % of Total Expenditure	Capital Expenditure as % of GSDP
2002-03	15705	949	6.04	1.09
2003-04	17427	1932	11.08	1.99
2004-05	18048	878	4.87	0.82
2005-06	19528	817	4.18	0.66
2006-07	22077	903	4.09	0.62
2007-08	27259	1475	5.41	0.84
2008-09	30903	1696	5.49	0.84
2009-10	34068	2059	6.04	0.89
2010-11	38790	3364	8.67	1.28
2011-12	50896	3853	7.57	1.23
2012-13	59228	4603	7.77	1.12
2013-14	66244	4294	6.48	0.92
2014-15	76744	4255	5.54	0.83
2015-16	87032	7500	8.62	1.33
2016-17	102383	10125.95	9.89	1.64
2017-18	110238	8749	7.94	1.27

Source: Budget Document, GoK

White Paper on State Finances released in June 2016 underscores the need to find innovative methods to recover lost ground in capital investment in the State and need for the State to leverage extra budgetary resources to augment the limited resources that can be mobilised through budget, for capital expenditure. An important aspect of infrastructure financing is the considerably longer term of investments. Traditionally the onus of financing, implementing, operating, and maintaining public infrastructure rests with the government through budgetary support. In the interests of fiscal discipline, the State has to confine its borrowings within the limits (3 per cent of GSDP) prescribed under the Fiscal Responsibility and Budget Management (FRBM) Act. Bound by FRBM targets, budgetary support from the state to finance requirement of infrastructure projects is limited. To bridge the gap the State has taken recourse to off-

budget borrowing through SPVs and business models like Public- Private Partnerships (PPPs), CIAL model etc.

5.2.1 Kerala Infrastructure Investment Fund Board

To address the need for financing infrastructure, Kerala Infrastructure Investment Fund Board (KIIFB) was revived in 2016 with the mandate to raise off-budgetary resources. Structure of KIIFB was modified to enable it to finance wide ranging infrastructure projects. The amendment also provided for utilising the new infrastructure fund mobilisation structures approved by Securities and Exchange Board of India and Reserve Bank of India. KIIFB raises its resources through multiple investment avenues which include modern investment structures like Infrastructure Investment Trust (InVIT), Infrastructure Debt Fund (IDF), Alternative Investment Fund (AIF), financial instruments-General Obligation Bonds, Land Bonds, Infra Bonds, tailor-made investment packages through existing government financial agencies like Kerala State Financial Enterprises Ltd. (KSFE), grants, annuities and other guaranteed payments from Government, returns from investments, loans from domestic /bilateral /multilateral financial institutions etc.

Few other options available to the government for financing infrastructure are examined by the Commission.

5.2.2 CIAL Model

This is the financial model used for financing construction of the Cochin International Airport (CIAL). The model is amenable for use in infrastructure projects or industrial projects with structured revenue flow from its operations. An understanding of CIAL investment model will be useful for planners and administrators.

Cochin international airport is the first airport in India to be built under a new business model and is owned by a public limited company called Cochin International Airport Limited (CIAL) floated by Government of Kerala in 1994. Envisaged source of funds were interest-free loans from non-resident Indians working overseas, donations from industrial undertakings, exporters, cooperative societies, and loans from the state government.

CIAL model have significant differences with the Public-Private Partnership (PPP)

model of infrastructure and public services financing. Government of Kerala holds 33.36% stake, making it the single largest investor in the project. Central PSUs like Air India, BPCL and Airport Authority of India hold 8.74 percent share, while foreign companies holds 5.42 percent share. Other Indian companies hold 8.57 percent, while scheduled commercial banks like Federal Bank, SBT and Canara Bank hold 5.91 percent. Remaining 38.03 percent of shares is held by more than 10,000 individual investors from 29 countries, mostly non-resident Indians. The company subsequently went for public offering and gave 10 million shares to HUDCO as part of debt settlement, which gave HUDCO 3.37 percent share in the company and reduction in shareholding of others. Government of Kerala continues to be the single largest shareholder. Kannur International Airport Limited (KIAL) is implemented based on this model

Kerala's experience of CIAL model in infrastructure development financing is a success story and is replicable.

5.2.3 Public Private Partnership (PPP) Model:

PPP is an 'arrangement between government and private sector for the provision of public assets and/or public services. Public-private partnerships facilitate implementation of large-scale government projects, such as roads, bridges, or hospitals, with private funding.

It is acknowledged that the private sector can play a substantial role in infrastructure development, and with the right policies and frameworks adequate private investment can become available. Therefore, PPP is one of the options that can be adopted to accelerate execution and operation of infrastructure in the State. Presence of a legal and statutory framework is required to facilitate private investment in infrastructure.

Kerala's experience with PPP has many successes and few failures. Vilappilsala Solid Waste Management Plant in Thiruvananthapuram may be considered as the first PPP in the State. Other examples are: Mattancherry BOT bridge; Thavakkara Bus station in Kannur; DP World Container Transshipment Port Kochi; Maniyar Carborundum Universal Hydroelectric Project; Iringal Craft Village Vadakara; Bakel Tourism Resorts project; Jatayupara Tourism project Chadayamangalam in Kollam district; Vizhinjam International Seaport; Trivandrum City Road Improvement project etc.

Success of any contract lies in the drafting of the contract. This assumes more significance in PPP contracts. Another important point while preparing draft PPP agreement is the judicious sharing of risks throughout the life cycle of the project. The model is flexible and include various types - Build -Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), Build-Own-Operate (BOO), Design-Build-Finance-Operate-Transfer (DBFOT), Operation& Maintenance (O&M) etc., and selection of model depends on the nature of the project.

It is brought to the notice of the Commission that the state government earlier drafted an Infrastructure Development Bill. This may be considered for legislation.

ARC recommends that based on previous experience in PPPs, government needs to consider adoption of PPP model with right risk sharing for implementation of infrastructure/public service projects.

5.2.4 Corporate Social Responsibility (CSR) funds:

Corporate Social Responsibility funds are a source that is not adequately utilised by the State. According to the Companies Act, 2013, firms with net worth of Rs.500 Crore or more, or turnover of Rs. 1000 Crore or more, or net profit of Rs.5 Crore or more are required to spend 2 percent of average net profit of the preceding year on Corporate Social responsibility (CSR) activities. Initiatives under CSR include - promoting gender equality, empowering women, promoting education, eradicating hunger and poverty, rural development projects, conserving natural resources, research in science, technology, and medicine, supporting incubators funded by centre or state governments. In 2017-18, share of funds received by the state under CSR as a proportion of total CSR funds in India is only 0.5 per cent.

ARC views that the State needs to be more proactive in attracting CSR funds to projects wherever they are applicable. Projects/initiatives which can utilise CSR fund shall be identified every year by the Government and published in government portal inviting companies to take up or assist these initiatives.

5.2.5 Term loans from banks/raising bonds through Securitisation of SFC devolutions:

State Finance Commission devolutions to LSGIs are constitutionally guaranteed revenue share of State taxes. A portion of SFC devolutions to LSGIs, as decided by _____

Government, may be escrowed to a separate account maintained by an SPV in a bank for servicing the principal and interest of term loan/bonds. The SPV will provide financial assistance to various LSGIs for implementing infrastructure projects. Term loan from the banks/bonds may be structured for servicing through securitization of escrowed SFC devolutions. Government may consider authorising Kerala Urban Rural Development Finance Commission (KURDFC) to issue bonds or for taking term loan from banks.

5.2.6 Other sources of institutional finance:

1. India Infrastructure Finance Company Limited (IIFCL):

IIFCL was set up in 2006 to provide long term debt for infrastructure projects. The provision of long-term funds from commercial banks is restricted due to asset-liability mismatch. IIFCL address the constraints in long term debt financing for infrastructure. IIFCL provides financial assistance to commercially viable projects, which include projects implemented by a public sector company, a private sector company, or a private sector company selected under Public Private Partnership (PPP) model. Priority is given to PPP projects awarded to private companies, which are selected through competitive bidding process. IIFCL raises funds from domestic as well as external markets on the strength of government guarantees. Mode of lending include long term debt, refinance to banks and financial institutions for loans granted by them to infrastructure companies, take out finance, subordinate debt, and any other mode approved by Government from time to time. The total lending by IIFCL is limited to 20% of the total project cost.

2. Leveraging excess/under utilised public land.

There may be excess government land available along the right-of-way of new roads or adjacent to public transport terminals, infrastructure projects, oxbow lands formed as a result of development of existing roads, other under utilised or no longer essential land. Value of the excess land would have increased due to its proximity to the developed infrastructure projects. Government may study effectiveness of utilising the valuable land for financing infrastructure development through long term lease.

5.3 Issues in Asset Management

5.3.1. Database on infrastructure and Assets Register

Civil infrastructure plays a significant role in social and economic outcomes of a region/country. It includes roads, railways, bridges, tunnels, ports, airports, distribution grids/networks (such as pipes, poles and wires used in water, sewage, electricity, communications etc), and dams and so on. The assets owned by government are extremely valuable, their custody and stewardship assume great importance. Timely maintenance and upkeep of these assets is important. Comprehensive assessment of available civil infrastructure is essential for its maintenance and management. Detailed provisions on asset maintenance are included in the revised PWD Manual 2012. Section 2602 and 2702 of PWD Manual stipulates maintenance of Asset Registers for roads and bridges, respectively. Manual of Asset Management in Local Self Government Institutions in Kerala published vide G.O (Rt) No.166/2017/LSGD dated 20.01.2017 is applicable to management of assets of LSGIs. Both these Manuals require maintaining an updated Asset Register for timely repair and maintenance of assets. Currently development and maintenance of all government infrastructure is done by Public Works Department (PWD) and the Local Self Government Department (LSGD).

5.3.2 Organisational structure

For the purpose of asset management, government infrastructure assets need to be classified into Land Assets and Physical Assets. Separate structures are needed for the management of these assets.

Land Assets: Government land in the state is classified as Revenue, Forest, Panchayat and land owned by various departments/agencies/institutions. Currently there is no clarity in the extent of land owned/held/alienated by government. Most of the departments do not have accurate data of land in their possession. It is also not clear as to which department is the custodian of government land- Land Revenue department or PW department or LSGIs.

Section 2501.2 of PWD Manual reads: ‘The land plans and land records are the basic documents of proprietary right of government/department. Therefore, land plan showing boundaries of the area etc should be recorded and updated from time to time’. From the above Section of PWD Manual it could be assumed that PW department is

mandated to keep all details pertaining to government land but does not mean that custody of the land is with PW department. For ensuring optimum utilisation of land it is essential to entrust custody and maintenance of land records to one department.

Physical Assets: For the purpose of this report, Physical Assets include government buildings like hospitals, public offices, schools and colleges, rest houses, guest houses, social welfare institutions etc, roads which are not under LSGIs, and bridges, flyovers, elevated highways etc. As in the case of management of land assets by the department of Land Revenue the management of buildings needs to be the responsibility of PW department which is entrusted with the construction and maintenance of most government buildings.

5.3.3. Asset Management

Over the last several decades Kerala has created a reasonably good physical and social infrastructure. Physical and social assets created as part of the development process are not properly maintained mainly due to meagre provision for maintenance in the state budget because of fiscal constraints faced by the Government. Aptitude for large plan size and strict guidelines for the use of plan funds for new projects while contributing to creation of new assets have left behind repair and maintenance of old assets created. Net result is that Government has accumulated an increasing maintenance deficit leading to sub optimal services from the assets created and, in many cases, premature failure/collapse of the assets itself. Improvement in delivery services by government can be achieved only if assets of government are properly maintained.

Government created an Asset Maintenance Fund for ensuring timely maintenance of existing assets in selected institutions. It is envisioned as a corpus replenished with accruals from provisions in the annual budget. The fund is still in operation but may not be achieving its objectives. It can be seen that the 'Kerala Asset Maintenance Fund Scheme' issued vide G.O (Ms)No.343/09/Fin dated 14.8.2009 is not comprehensive to address the issue of prompt maintenance of all government assets. A main limitation of the existing Asset Maintenance Fund is that it covers only selected institutions in government.

5.4 Space Utilisation

Increase in adoption of information technology tools like e-governance, digitisation, e-office etc. may reduce, to some extent requirement of space in office buildings. Space for storage of files, working space for employees etc., will reduce considerably after total roll out of e-office and computerisation. Need for recruiting typists, stenographers and supporting staff has already reduced. It remains a fact that few additional posts need to be created for supporting rollout of e-governance initiatives. However, the numbers of such posts are few. With the advent of e-governance to file processing, and digital delivery of services, more office space may become surplus. Considering these aspects and other impacts of e-governance, future plans for building public offices needs to be based on need analysis and space audit.

5.5 Land Acquisition for Infrastructure Development.

Land acquisition is done at present based on ‘Right to Fair Compensation and transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013’. As the name suggests the act regulates land acquisition and lays down the procedure and rules for granting fair compensation, rehabilitation, and resettlement to affected persons. Most of the issues associated with land acquisition are addressed in the Act.

‘Negotiated purchase’ is one of the methods of land acquisition in many parts of India and in other countries. This method is popular mainly because of its advantage of acquiring land in a shorter period of time. Negotiated purchase of land through a transparent process ensures timely completion of the process of acquisition and avoids future litigations.

Government resorts to freezing of lands proposed to be acquired, for long periods. This tantamount to an act of aggression against the rights of the people and denies them opportunity to utilise their land for productive purposes.

5.6 Abandoned/Stalled/Incomplete Projects

There are many infrastructure projects in Kerala which are stalled/ abandoned and are incomplete for various reasons. Construction of most of them started during earlier plan periods. The Commission do not intend to go into the details of such projects and analyse specific reasons for delay in completion/ abandoning. These projects were

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started to meet infrastructural needs of the people. There is no justification for keeping these projects as symbols of government failure. Scarce government land and land acquired and given for these projects are lying idle and at the same time several departments are in search for land for new infrastructure projects. Sunk cost of these projects is also huge.

The following two pictures are representative samples of the above said category of projects:



District Planning Secretariat building Palakkad.
Construction Started in the year 2010, Image
shows present status in 2020



Cold Storage, Kunnukuzhy
Thiruvananthapuram.

5.7 Capacity Development for Project Management.

When analysing the reasons for stalling/delayed completion/abandonment of infrastructure projects it can be seen that inadequacy of funds is not the main reason for time and cost overrun but it is project management issues that holds up progress of work/completion of many projects. Though Kerala has a very good cadre of engineers and their engineering skills are unquestionable, lack of skill and training in project management results in delay in the completion of projects. This issue is discussed in detail in Part 1 of the report.

5.8 Recommendations

- 1. ARC recommends that Government may create a Project Financing & Management Cell in the Planning Department.**
 - **Proposals for infrastructure development projects before inclusion in the budget needs to be referred to this Cell for exploring the possibility of implementing the projects through extra budgetary resources or through adoption of other business models.**
 - **The Cell shall be capacitated to evaluate Technical Feasibility, Financial Viability, Socio-economic Benefits etc., of the projects. The Cell shall have the services of financial, legal, project management experts selected from government departments/institutions based on transparent criteria, on deputation for 3 to 5 years.**
 - **This Cell shall have the responsibility to develop, update and maintain Infrastructure Master Plan for Kerala.**
 - **The proposed Project Financing Cell in Government will act as coordinating mechanism for Finance Department, KIIFB, State Planning Board and Administrative Departments in Government.**
- 2. The Commission recommends that infrastructure development in the state needs to be based on a master plan. Master plans are usually prepared for a period of 20 to 30 years. Along with the master plan, an implementation plan also needs to be prepared and strictly enforced. Yearly review of Master plan is needed to factor in required changes. Any deviation or updating shall be based on the recommendation of a group of experts constituted for the purpose and approval of government. The Master Plan needs to be based on requirements of the state in key infrastructure and social sectors, develop a strategy on infrastructure development and identify projects to be implemented during the validity period of the master plan. The Commission recommends that the Government shall take urgent steps to prepare an Infrastructure Development Master Plan for the next 25 years with flexibility for yearly revision. The Project Financing Cell suggested above will handhold and owns the IMP.**

- 3. ARC recommends that Public Works and Local Self-Government departments needs to take action within three months for systematic updating of information of all civil infrastructure and prepare a comprehensive database of assets. If the departments find it difficult to collect and compile the data, outside agencies may be assigned to do the work as a one-time assignment. Possibility of entrusting the work to engineering colleges may be explored. Subsequent updating and maintenance of the data base/register shall be done by PWD/LSGD. Departments whose assets are mapped shall be given access to the data. Required training needs to be given for preparation, use and maintenance of the data using information technology tools. The departments can have common software for updating details of assets. All activities related to assets including improvement, additions, maintenance etc shall be linked to the digital Asset Register. Additional details like future development required, land details etc. also need to be incorporated in the Asset Register.**
- 4. Departments/Institutions shall prepare land plan of each parcel of land in their possession including the extent of land utilised for construction of office buildings/other structures. This shall be a onetime exercise and can be done with the help of Survey and Land Records department. Amendments, if required may be made in Section 2501.2 in PWD Manual to relieve the PW department from maintaining land plans and land records of government land. Instead, the department may be entrusted with maintaining of updated records of all government building assets, save those transferred to LSGIs.**
- 5. Similar to management of all government land by Land Revenue department, all government buildings with various departments needs to be managed by PW department. Power, water, and IT installations in these assets also needs to be the responsibility of PWD. Custody of the buildings may remain with the concerned departments itself. But maintenance of these assets or additions needs to be done through the PWD. PWD shall maintain updated data with relevant details of all the government buildings in a digital platform to be shared with concerned departments, prepare annual maintenance plans as per PWD Manual and carry out maintenance without any deviation from the prepared maintenance plan.**

6. All transactional rights including sale, lease, rental, and transfer of assets among departments and governmental agencies shall vest with the Government. Any hitches arising from the management of land by LR department and buildings by PW department may be resolved through amendment to existing legislations or through a new enactment.
7. ARC recommends formulation of a comprehensive scheme for maintenance of government assets, setting up of a Fund for asset maintenance and inclusion of all physical infrastructures in the scheme. The Fund needs to be administered by the PW Department and managed by a Committee consisting of Secretaries of Finance, Revenue, Planning and Public Works departments. At least 5 percent of the budget provision for capital expenditure needs to be set apart annually for the Asset Maintenance Fund. Allocation from this Fund shall be against Annual Asset Maintenance (AAM) Plan prepared by PW Department and subject to approval of the Fund Management Committee. Once constituted, proper use of the fund requires preparation of maintenance plan for all departments by Public Works department before the start of the financial year. In addition to allocations against AAM Plan, at least 10% of the Fund needs to be allocated to Chief Engineer (Buildings) at the beginning of the financial year to meet urgent maintenance and repair of public infrastructure frequently visited by the public. Utilisation of the fund shall be reported to the Secretary PWD for placing before the Fund Management Committee.

Asset Management Scheme shall be only for maintaining assets of departments. Management of assets of institutions transferred to LSGIs shall be governed by Manual of Asset Management in LSGIs in Kerala issued vide G.O (Rt)No.166/2017/LSGD dated 20.1.2017.

8. Space audit needs to be done for all government buildings to assess adequacy/inadequacy/availability of excess space to ensure optimum use of physical resources and effective functioning of government offices/institutions. Excess space/assets identified maybe handed over to offices/institutions/departments who have limited availability of space/functioning in rented buildings. Government shall establish a

mechanism to monitor and ensure optimum utilisation of government infrastructure and prevent underutilisation. New construction of office buildings shall be taken up only after conduct of space audit.

- 9. ARC recommends that government may consider feasibility of negotiated purchase of land through a transparent process, before initiating land acquisition proceedings under Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and resettlement Act, 2013. This will expedite the process of land acquisition and ensure timely completion of projects. Opting for negotiated purchase will also ensure that procurement or bidding processes starts only after completing acquisition of at least 50 percent of the land required for a project and will also reduce litigations.**

Freezing of land may be resorted to only in the case of projects for which a definite time frame for implementation is fixed. If land is not acquired within the time frame, legal restraint against the land needs to be removed without any additional conditions. Freezing of land shall be limited to a reasonable period, as decided by the government and in any case, it should not be for more than three years.

Compensation for the land acquired needs to be paid on takeover of the land. Legal formalities need to be concluded at the earliest. Land acquisition for any government department or agency shall be the duty of LR department. Land acquisition cost need to be paid by departments/agencies to LR department before starting the acquisition processes. In some cases, rehabilitation packages are to be declared for facilitating acquisition. In such cases LR department needs to plan and implement the rehabilitation package before taking over the land, within a reasonable time frame.

- 10. ARC recommends that government needs to ensure transparency in procedures for implementation of infrastructure projects and make available relevant information such as project cost, socio economic benefits of the project, environmental impact, details of eviction, if needed, etc., to the public. It shall be the responsibility of the acquisition department that manages the project to publish these details for public information.**

11. ARC recommends to Government to constitute a task force to identify stalled/incomplete/abandoned projects. The Task Force may elicit details of the projects- purpose of the project, project cost at the time of inception, project report, present status of the project/construction, legal implications of construction contracts etc. The task force shall submit report to government with viable recommendations on need of the project, possibility of revival, alternate proposals, for utilising the available infrastructure and land, legal proceedings etc.
12. As recommended in Part 1 of this report, government needs to consider incentivising the employees who complete Project Management Professional (PMP) and certified Financial Analyst (CFA) certification programmes, for bridging the gap in availability of skilled human resources for Project Management. The Commission also recommends starting courses on Project Management in the state. The course may be offered by Centre for Management Development (CMD)/Kerala Highway Research Institute (KHRI)/selected Engineering colleges/Management Institutes. Selected institution may facilitate the students for PMP Certification and develop curriculum for Certificate and Diploma courses in PMBOK. 50 percent of the seats for the courses shall be reserved for employees in the engineering cadre of the state. The institutes also need to conduct online courses for facilitating participation.
13. ARC recommends that the State needs to be more proactive in attracting CSR funds to projects wherever they are applicable. Projects/initiatives which can utilise CSR fund shall be identified every year by the Government and published in government portal inviting companies to take up or assist these initiatives.
14. ARC recommends that based on previous experience in PPPs, government needs to consider adoption of PPP model with right risk sharing for implementation of infrastructure/public service projects ensuring transparency and draft Infrastructure Development Bill once published in government of Kerala website may be considered for legislation.

Annexure 1: List of Assets Studied

#	Type of Institution	Institutions visited at Thiruvananthapuram.
1	Healthcare Institution	General Hospital, Neyyantinkara
2	Educational Institution	Government Girls Higher Secondary School, Nedumangadu
3	Law and Order Institution	Museum Police Station
4	Social Welfare Institution	Old Age Home for Women, Poojapura
5	Administrative Office	Vikas Bhavan, PMG

#	Type of Institution	Institutions visited at Kasaragod
1	Healthcare Institution	Public Health Centre, Kumbadaje
2	Educational Institution	Govt. Vocational Higher Secondary School, Delampady
3	Law and Order Institution	Police Station, Badiyadukka
4	Social Welfare Institution	Government MahilaMandiram, Paravanadukkam
5	Administrative Office	Sub Registrar Office, Majeshwaram

#	Type of Institution	Institutions visited at Wayanad
1	Healthcare Institution	Taluk Headquarters Hospital, Sulthanbathery
2	Educational Institution	Model Police Station, Meenangadi
3	Law and Order Institution	Government Higher Secondary School, Vythiri
4	Social Welfare Institution	Government Children's Home, Kaniyambetta
5	Administrative Office	Taluk Office, Mananthavady
6	Government Building	Government Guest House, Sulthanbathery

Annexure 2: Asset Images
Assets visited in Trivandrum District



Lively Paediatric Ward at General Hospital, Neyyantinkara, Trivandrum
The bedsheets also had the day of the week printed, so it was possible to assess if the sheets were replaced



Staff room at Government Girls Higher Secondary School, Nedumangadu, Trivandrum



New building (FIIFB funded) under construction at Government Girls Higher Secondary School, Nedumangadu, Trivandrum

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Cramped Officers' resting area in the exterior of the Museum Police Station, Trivandrum



Well-kept SI's Room at Museum Police Station, Trivandrum



Temporary shed in Museum Police Station, Trivandrum

(The blue cloth hides behind it, case files kept on a temporary loft)



Evidence Room in Museum Police Station, Trivandrum



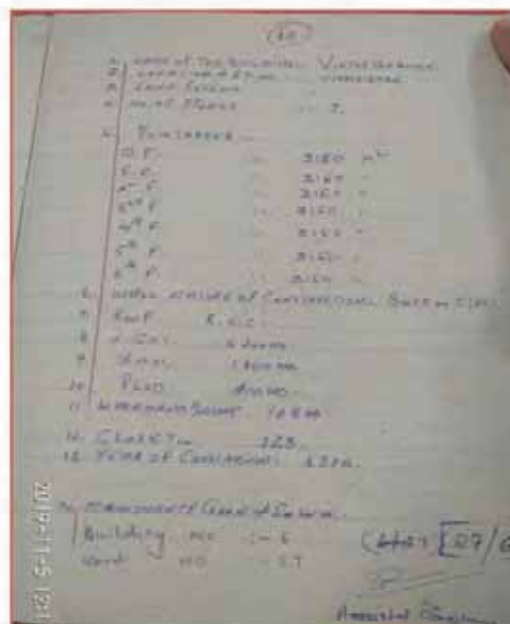
**Dormitory, Old age home for women,
Poojapura, Trivandrum**
(Mattresses recently removed due to bed-bugs)



**Wall in Old age home for women, Poojapura,
Trivandrum**



**Poorly maintained administrative building,
Vikas Bhavan, Trivandrum**



**Outdated Asset Register – Vikas Bhawan,
Trivandrum**

While spaces inside individual offices were well maintained, all common areas required serious maintenance.

Assets visited in Kasaragod District



Fully constructed and inaugurated Public Health Centre awaiting electricity connection at Kumbadaje, Kasaragod



Disconnected classrooms constructed at Govt. Vocational Higher Secondary School, Delampady Kasaragod



Impounded vehicles at Police Station, Badiyadukka, Kasargode



Impounded vehicles at Police Station, Badiyadukka, Kasargode



Kitchen at Government Mahila Mandiram, Paravanadukkam, Kasaragod



Spacious office facilities at the new SRO premises in Manjeshwaram, Kasaragod

New record keeping facilities at the renovated SRO building in Manjeshwaram, Kasaragod

Assets visited in Wayanad District



**Panoramic view of disconnected construction at Taluk HQ Hospital, Sulthanbathery
(Right side)**



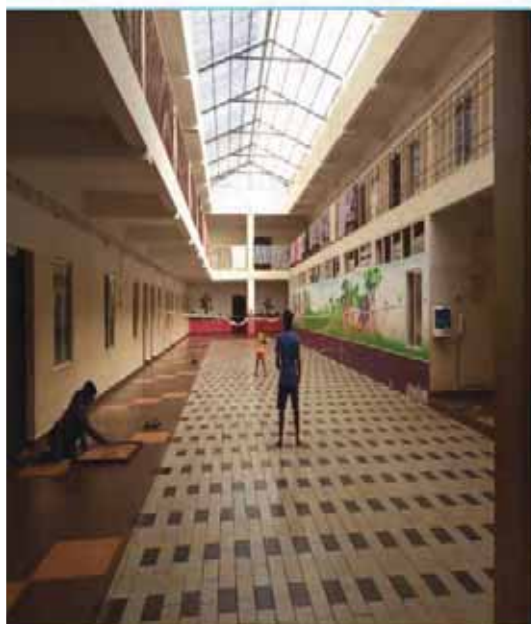
**Use of best in class furnishing brands (DORMA) at the Taluk Headquarters Hospital,
Sulthanbathery**



**Reading material for persons waiting, at
Model Police Station, Meenangadi,
Wananad**



*Temporary shed created due to lack of space at
Model Police Station, Meenangadi, Wayanad*



**Well-lit (with natural light) and spacious open
area for children to play games - Government
Children's Home, Kaniyambetta, Wayanad**



**Colorful wall of a dormitory at Government
Children's Home, Kaniyambetta, Wayanad**

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**Waste burnt within school premises at
Government Higher Secondary School,
Vythiri, Wayanad**



**Need for better waste management at the
Government Higher Secondary School, Vythiri,
Wayanad**



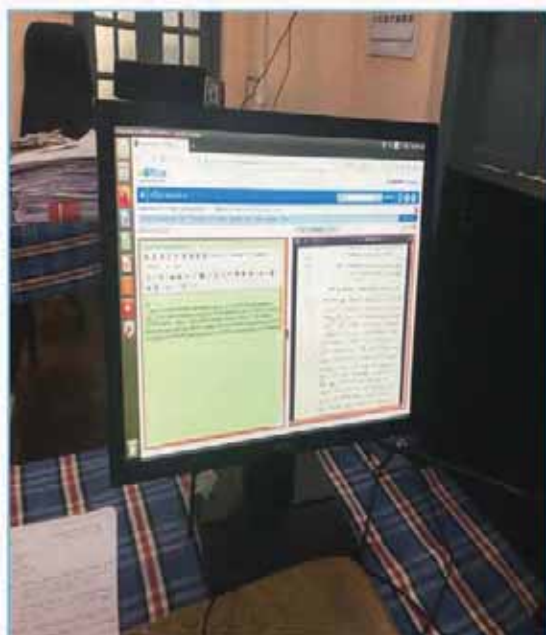
**Fire safety measures taken and prominently displayed at Government Higher Secondary School,
Vythiri, Wayanad**



Picture of rod protruding from the stairs used by children and adults daily at Government Children's Home, Kaniyambetta.



Some areas such as washing areas required attention of the caretakers - Government Children's Home, Kaniyambetta



Adoption and implementation of e-office at Taluk Office, Mananthavady, Wayanad, because of initiative of a former Collector



Heritage building of Taluk Office, Mananthavady, Wayanad

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Government Guest House, Sulthan Bathery, Wayanad

Annexure 3: Minutes of the Meetings Held

Sl. No.	Date	Meeting Details
1	16 October, 2019	Meeting with the Station House Officer (SHO), Museum Police Station, Thiruvananthapuram.
2	17 October, 2019	Meeting with the Principal, Government Girls Higher Secondary School, Nedumangad.
3	29 October, 2019	Meeting with the Superintendent, Old Age Home for Women, Poojapura.
4	30 October, 2019	Meeting with the Public Relations Officer (PRO), General Hospital, Neyyatinkara.
5	5 November, 2019	Meeting with the AE/ Estate Officer, Vikas Bhavan, PMG.
6	8 November, 2019	Expert Group Meeting to review the progress of the study.
7	28 November, 2019	Meeting with the Superintendent, Mahila Mandiram, Kasaragod.
8	28 November, 2019	Meeting with the Civil Police Officer (CPO), Police Station Badiyadukka, Kasaragod.
9	28 November, 2019	Meeting with the Medical Officer, Public Health Centre, Kumbadaje, Kasaragod.
11	29 November, 2019	Meeting with the Head Master, Government Vocational Higher Secondary School, Delampady, Kasaragod.
12	29 November, 2019	Meeting with the Sub-registrar, Sub- Registrar's Office, Manjeshwaram, Kasaragod.
13	13 December, 2019	Meeting with the Public Relations Officer (PRO), Government Taluk Headquarters Hospital, Sultan Bathery
14	13 December, 2019	Meeting with the Station House Officer, Police Station, Meenangadi
15	13 December, 2019	Meeting with the Principal, Government Higher Secondary School (GHSS), Vythiri
16	12 December, 2019	Meeting with the Superintendent, Government Children's Home, Kaniyambetta
17	12 December, 2019	Meeting with the Deputy Tehsildar, Taluk Office, Mananthavady
18	13 December, 2019	Meeting with the Joint Director, Department of Tourism, Calicut
19	6 January, 2019	Meeting with the Managing Director and Chief Engineer, KPHCC, Trivandrum

a. Meeting with the Station House Officer (SHO), Museum Police Station

Meeting Information	
Meeting Name/Topic	Meeting with the SHO, Museum Police Station
Date/Time	16 October 2019, 4:00 PM

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Meeting Attendees	
Sl. No.	Attendees
1	Mr. Biju. U, Station House Officer & Circle Inspector, Museum Police Station.
2	Mr. Shanavas, Assistant Sub Inspector, Museum Police Station.
3	Mr. Jahangir, Civil Police Officer, Museum Police Station.
4	Mr. Biju Narayan, Centre for Management Development.
5	Mr. Dhruv Goyal, Centre for Management Development.
6	Ms. Sanjana Pothen, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the SHO on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the office to capture basic information about the asset and to give the users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Basic asset details</p> <p>Total area of the asset: 5 cents.</p> <p>Total built area: N/A</p> <p>Sanctioned strength: 80</p> <p>Filled strength: N/A</p>
3	<p>Planning:</p> <p>Since the building was inaugurated in 1993, the current sets of officers were not directly involved in the planning process. This has led to several difficulties in asset usage.</p> <p>Mr. Biju mentioned that police station is taking steps to implement people friendly measures such as having a child friendly area, Janamaithri area (people friendly station area), counseling centres, etc. However, his experiences from Adoor & Trivandrum show that buildings are constructed as fragmented units instead of multi storied ones. This limits space for other purposes such as parking staff vehicles, visitor vehicles and vehicles which have been towed/involved in accidents.</p> <p>Further details about considerations at the planning phase will have to be obtained from PWD/Museum department.</p>

Discussion Points	
4	<p>Design:</p> <p>A model police station should have:</p> <p>A parade ground.</p> <p>Parking space for towed vehicles/ vehicles involved in accidents.</p> <p>A CD/File room.</p> <p>An evidence/Material Objects (MOS) room.</p> <p>Adequate space for computer/CCTNS.</p> <p>Adequate restrooms corresponding to number of staff/visitors.</p> <p>A separate toilet for prisoners which is designed in such a manner which ensures that he/she doesn't hurt himself/herself physically.</p> <p>A separate room for interrogation which provides direct access of the scene through video camera/CCTV.</p> <p>Adequate furniture for all the above.</p> <p>Of the requirements mentioned above, the police station visited had:</p> <p>A reception and office area.</p> <p>A separate room for Circle Inspector and Sub Inspector.</p> <p>An ammunition room.</p> <p>A makeshift arrangement for storing evidences.</p> <p>A records room.</p> <p>Separate resting room for men & women with minimal facilities.</p> <p>A computer/CCTNS room.</p> <p>The crime branch was accommodated in a makeshift arrangement. Mr. Biju suggested separate workstations/cabins for the crime wing.</p> <p>5 toilets: one each in the CI's and SI's room, one in the women's resting room and two for the remaining staff.</p> <p>Furniture provided are not useful in many cases: For example, the tables in crime wing are large and take up a lot of space in the already congested room.</p> <p>Racks to keep files are also not planned in accordance with room size.</p> <p>No parking area. Further, as the police station faces the main road, there is frequent inconvenience for the public to park their vehicles.</p>
5	Procurement: N/A
6	Construction: N/A

	Discussion Points
7	<p>Operations & Maintenance:</p> <p>For initiating maintenance work, the SHO has to request the DPC (Deputy Police Commissioner) who then notifies PWD after aggregating complaints from different stations. Further, as the police station is part of the Museum Heritage Structure, any maintenance work by PWD can begin only after approval/permission is obtained from the Museum authority.</p> <p>For police stations which are not heritage structures, maintenance is undertaken by KPHCC (Kerala Police Housing Co-operative Society). This was earlier done by PWD who has a better track record in maintenance.</p> <p>Mr. Biju suggested an integrated Construction & Maintenance contract is put in place so that the contractor in charge undertakes construction activities in such a way that minimum future maintenance is required.</p> <p>Electrical and Water</p> <p>Water supply is unreliable.</p> <p>Electrical wiring is very old. Any electrical work to be undertaken, requires a Work Order (WO), the entire process takes more than a year in total. (aggregation process)</p> <p>The air conditioner is not in working condition.</p> <p>Internet connectivity is provided but speed is less.</p>
8	<p>Others</p> <p>There is lack of stationery items such as pens, papers, forms, twines, carbon etc. For example: One bunch of paper (500 in number) is supplied for the station per month whereas the average number of cases registered per month is 180.</p> <p>No fingerprint scanner machine (The process is still done using ink-on-paper method).</p> <p>Staff refuses to use the police vehicle since a directive has been issued which place the onus of any accident on the person using the vehicle.</p> <p>Purchases: All purchases are supplied from the department store at the district level. There is no imprest for any local purchases.</p>

b. Meeting with the Principal, Government Girls Higher Secondary School, Nedumangad

Meeting Information	
Meeting Name/Topic	Meeting with the Principal, Government Girls Higher Secondary School, Nedumangad
Date/Time	17 October 2019, 10:00 AM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Sarath Chandran, Principal, Government Girls Higher Secondary School, Nedumangad.
2	Ms. Rajeshwari, Government Girls Higher Secondary School, Nedumangad.
3	Mr. Teriyam Jayakumar, PTA President, Government Girls Higher Secondary School, Nedumangad.
4	Mr. Dhruv Goyal, Centre for Management Development.
5	Ms. Aishwarya Kuruttukulam, Centre for Management Development.
6	Ms. Sanjana Pothan, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the Principal on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the school to capture basic information about the asset and to give the asset users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Basic asset details</p> <p>Total area of the asset: 5 acres.</p> <p>Total built area: N/A.</p> <p>Total strength of the school: 2500.</p> <p>Number of specially challenged students: 60</p> <p>Number of female teachers: 100.</p> <p>Number of male teachers: 10-11.</p>
3	<p>Planning:</p> <p>Funds are allocated on a yearly basis on the basis of the demands submitted by the school to the municipality during their yearly planning phase.</p> <p>However, there is no contingency fund available for unforeseen needs. Any expense incurred is either submitted to the municipality for refunds/ borne by the PTA through its fund. (The PTA collects INR 100/ student every year).</p>

Public Infrastructure

Development & Management

	Discussion Points
	<p>Mr. Jayakumar mentioned that physical and human infrastructure in the classrooms are inadequate compared to the rise in number of students. In the current scenario, there are more than 70 students in one class with inadequate furniture and teachers. With an average time of 30 minutes/ class, the teacher finds it difficult to focus on all the students. This leads to poor learning outcomes.</p> <p>He suggested that if learning outcomes have to improve, class strength should not be higher than 30.</p>
4	<p>Design:</p> <p>Inadequate number of toilets: There are approximately 50 toilets for 2500 students.</p>
5	Procurement: N/A
6	<p>Construction:</p> <p>A new Hi-Tech building is under construction. The school has been selected out of all the other schools in the Nedumangad municipality to have a Hi-Tech building under a government scheme. A Hi-Tech building is one which has facilities comparable to international standards such as computer labs, multimedia rooms, sound system, internet connection etc. The details of the project are given below:</p> <p>Date of Project Commencement: September 2018.</p> <p>Date of Completion: November 2019.</p> <p>Tender floating/Funding agency: KIIFB.</p> <p>Contractor Responsible: Saraswathy Constructions.</p> <p>Project Management Consultant: WAPCOS Ltd.</p> <p>Estimate amount: Approximately INR 6 crores. The project cost is within the budget allocated.</p> <p>The construction work faces the following challenges:</p> <p>There is lack of regular supervision by the CE (Chief Engineer) of the construction work.</p> <p>The CE is overburdened as he is in charge of monitoring 108 schools.</p> <p>Even though Education Secretary has given the directive for overseer to visit daily, there is no daily supervision.</p>
7	<p>Operations & Maintenance:</p> <p>Authority responsible for maintenance of old buildings is PWD and Nedumangad municipality.</p> <p>Inadequate number of cleaning staff: For the entire asset spread over 5 acres, there are only 2 cleaning staff (for toilet & premises). The cleaning staffs who were appointed by municipality have retired and the current staff has been appointed by the PTA using its own funds.</p>

	Discussion Points
	<p>There are no funds to repair the incinerator which is used to burn sanitary pads. No regular maintenance of the incinerator is undertaken.</p> <p>Any complaints/issues/needs are raised at the monthly municipality meetings. This is the highest level to which an issue can be escalated.</p>
8	<p>Miscellaneous information:</p> <p>The yearly Development Plan fund allocated for 14 schools in Nedumangad municipality(including 4 high schools) for different activities are detailed below:</p> <p>Breakfast (Std I to VII): INR 20 lakhs.</p> <p>Sanitary Pads: INR 1 lakh.</p> <p>Furniture (Single table & chair for each student): INR 26 lakhs.</p> <p>Academic activities (extra coaching for weak students): INR 7 lakhs.</p> <p>UPS & Computer: INR 4 lakhs.</p> <p>Library Room: INR 5 lakhs.</p> <p>Disabled Students: The school has a separate classroom with a specially trained teacher for such students. The school also encourages these students to showcase their talents by conducting special assemblies from time to time.</p> <p>Curriculum: Mr. Jayakumar also mentioned that the curriculum is not designed according to the learning capacity of the students.</p> <p>Duration of Classes: The duration of periods have come down after the government decision to increase the number of periods from 7 to 8. This has also limited time available for teachers to attend to each student individually.</p> <p>Lack of specialized teachers: There is lack of specialized teachers for IT, Sports, Arts and Crafts. In many cases, such posts have not been created by the government and the school lacks adequate funds to appoint teachers on contract basis. The current practice is to train existing teachers to take these classes which does not yield good results.</p> <p>Rise in number of student clubs: The proliferation in the number of student clubs have also reduced the time available for attending classes.</p> <p>Deployment of teachers in conducting census, work related to NCC (National Cadet Corps). SPC(Student Police Cadet), training etc limits their time available for teaching and many are not able to complete the syllabus on time.</p> <p>Recreation: For recreation and sports, no basketballs/volleyballs/play items are supplied by municipality.</p> <p>Waste treatment: The school does not have a treatment facility for treating waste water.</p>

Discussion Points	
	<p>School Committees: The school operates through different committees which hold their meetings on a monthly basis. These committees are explained below:</p> <p>The Parent Teacher's Association (PTA): A 21 member committee which looks after general affairs.</p> <p>The School Management Committee (SMC): A 22 member body which is similar to PTA (Parent Teachers Association).</p> <p>School Management Development Committee (SMDC): This is a 13 member committee which consists of the Principal, SRG (School Resource Group) convener, Science Teacher, Social Studies Teacher, Maths Teacher, a guardian from SC/ST & OBC, ward counselor and two subject experts.</p> <p>Noon meal committee: This committee looks after food needs.</p>

c. Meeting with the Superintendent, Old Age Home for Women, Poojapura

Meeting Information	
Meeting Name/Topic	Meeting with the Superintendent, Old Age Home for Women, Poojapura
Date/Time	29 October 2019, 3:00 PM

Meeting Attendees	
Sl. No.	Attendees
1	Ms. Sajitha, Superintendent, Old Age Home for Women, Poojapura.
2	Mr. Arun Babu, Project Staff, Old Age Home for Women, Poojapura.
3	Mr. Dhruv Goyal, Centre for Management Development.
4	Ms. Abhilasha Jain, Centre for Management Development.
5	Ms. Aishwarya Kuruttukulam, Centre for Management Development.
6	Ms. Sanjana Pothan, Centre for Management Development.

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Superintendent on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the old age home to capture basic information about the asset and to give the asset users a context of the study.

Discussion Points	
	The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:
2	<p>Basic asset details</p> <p>The facility started off as an Old age Day Care Centre for women in 2004 at Kalady. It was shifted to Trivandrum in 2009 as a day care centre for old women and later became a full time house in 2010.</p> <p>Parent department: Social Justice Department.</p> <p>Total area of the asset: N/A.</p> <p>Total built area: N/A.</p> <p>Sanctioned number of inmates: 25. (This is a Grade 3 institution. Institutions are graded as 1, 2, and 3 based on the sanctioned number of inmates which are 100, 50 and 25 respectively).</p> <p>Total number of inmates: 34</p> <p>Number of cancer patients: 2</p> <p>Number of staff: 5-6 excluding one casual sweeper (appointed by government on temporary basis). Additional staff, if needed are appointed on a contract basis as and when need arises).</p> <p>Number of floors: 2. (The institution is housed within the office building of the social justice department).</p>
3	<p>Planning and Design:</p> <p>The asset was planned and designed to function as a day care centre for elderly women but later was converted into a full time home.</p> <p>Mr. Arun mentioned that due to lack of stakeholder consultation during the planning phase, the asset cannot be considered as completely elderly friendly. This is evident from the following:</p> <p>The old age home in general is very cold and damp as walls retain much of the moisture content.</p> <p>There is no walking area/outside area for the inmates.</p> <p>Proper natural lighting and ventilation is available only on the first floor and not the ground floor.</p> <p>There is no common area for inmates to indulge in recreation/ entertainment.</p> <p>The edges of the walls are sharp (which is contrary to the specifications provided in the Old Age Home Manual, 2016).</p> <p>The floor of the main rooms and toilets are slippery.</p>

Discussion Points	
	<p>The switchboards are placed too high and are not within the reach of the inmates from their bed.</p> <p>There are no grab rails in common areas or in the bathrooms.</p> <p>Only few toilets are European style.</p> <p>In terms of design, though there is adequate space in the building in terms of bed gap etc, facilities are inadequate. However, sick rooms are congested.</p>
4	<p>Procurement:</p> <p>Ms. Sajitha explained that for infrastructure and acquisition of moveable assets, a yearly fund is allotted by the Social Justice Department. This amount is based on the requirements put forward by the institution every financial year.</p> <p>The institution also maintains a Furniture and Stock Register.</p>
5	<p>Construction:</p> <p>The construction of the building was undertaken by PWD in early 2000's.</p>
6	<p>Operations & Maintenance</p> <p>Ms. Sajitha explained that maintenance work for the asset is undertaken by PWD on request. The superintendent gives a request to PWD followed by estimate preparation by PWD and Administrative Sanction (AS).</p> <p>However, due to heavy workload and lack of funds with PWD, there is a huge delay in undertaking maintenance work.</p> <p>Currently, Administration Sanction (AS) has been obtained for maintenance work including plumbing, tiling and painting for INR 19.50 lakhs. The department has also given INR 5 lakhs for maintenance activities.</p> <p>Work is yet to start as the tender process is still going on. The work once started, is expected to be completed in 3-4 months.</p> <p>Date of sending the proposal for the above maintenance activity: May 2016.</p> <p>Date of AS: April 4, 2017.</p> <p>Date of fund transfer: March 23, 2019.</p> <p>Another maintenance request for rewiring will be given soon.</p> <p>Water: The monthly fund allocation for paying water bills by the Social Justice Department is INR 2000 while the actual bill amount comes up to INR 42,000. The institution has a pending water bill of INR 4.5 lakhs.</p> <p>Waste Disposal: The biogas plant which was earlier used for solid waste management is currently dysfunctional. Currently, most of the waste generated is thrown within the premises which creates an unhygienic environment for the inmates.</p>

Discussion Points	
7	<p>Miscellaneous information</p> <p>The Poojapura Social Welfare complex houses several institutions (each with their own superintendent) of the Social Justice Department as well as the Department for Women and Child Development. These are:</p> <p>Social Justice Department:</p> <p>Old Age Home for Women.</p> <p>Disability Home.</p> <p>Handicapped People's Home.</p> <p>Asha Bhavan (Women).</p> <p>Vocational Training Centre (where children with more than 40 percent disability are given free vocational training courses).</p> <p>Department for Women and Child Development:</p> <p>Mahila Mandiram.</p> <p>One Stop Centre for women.</p> <p>Admission of a member: This happens through two ways:</p> <p>Court order.</p> <p>The counselor/ward member gives a letter to the District Social Justice Officer (DSJO) to admit a destitute person from his/her ward to the institution.</p> <p>Staff: The Kerala Social Security Mission (whose office houses the institution) has provided 7 staff on contract basis for the institution. This included 2 nurses and 5 multi task care providers.</p> <p>If the institution is in need of additional staff, the superintendent can make an appeal to the Social Justice department which makes available required staff from Kerala Social Security Mission (KSSM).</p> <p>Any other appointment of staff is done on contract basis as per need.</p> <p>Funds for purchases:</p> <p>The superintendent can authorize a maximum amount of INR 1000.</p> <p>The Management Committee (headed by the collector) authorizes amounts between INR 1000 – INR 15,000.</p> <p>Amounts higher than INR 15,000 need sanction of the department.</p> <p>The facility receives less sponsorship amounts. Sponsorship funds can be utilized with more flexibility than other funds.</p>

Discussion Points	
	<p>The Management Committee (MC) (which consists of Collector, Superintendent, counselor, local politicians, jilla officer etc) is required to meet once in every 4 months or as per need. However, it has not met even once in the past 4 months.</p> <p>The MC has a joint account (Jilla Officer and Superintendent) for receiving funds and donations from the department and public. Any donation received also goes directly to this account. The institution does not accept cash donations.</p> <p>The superintendent can withdraw a maximum of INR 30,000 at a time to meet the needs of the facility. There is no limit to the number of withdrawals in a month.</p> <p>The actual bills of the purchases are submitted and recouped from the treasury.</p> <p>The MC has also got sponsorship to meet the food, clothing and medicine needs of the inmates.</p> <p>The facility maintains a cash book to record all transactions.</p> <p>Hierarchy: The Superintendent report to the District Social Justice Officer (DSJO) who reports to the Director of Social Justice Department (IAS officer). However, there is no direct communication between the superintendent and the Director of the department.</p> <p>Tenure: The average tenure of superintendents is very short (can extend up to a maximum of 3 years) which hampers continuity of work.</p> <p>The hospital utilizes the ambulance and vehicle service of Asha Bhavan (adjoining institute) to transport sick inmates to the hospital. In case of any sickness/disease, the inmates are referred to the General Hospital and provided free service.</p> <p>Ayurveda services are provided under the ‘VayoAmrutham’ project.</p> <p>There is no ICP (Individual Care Plan) for each inmate. However, Ms. Sajitha explained that each inmate has a file with their personal information, disease history and hospital records. Moreover, Mar Arun added that an ICP which also takes into account socio-psychological aspects is under preparation (modeled in line with NIMHANS specifications).</p> <p>Provisions: The department has a society to procure provisions (on credit) whenever needed.</p>

d. Meeting with the Public Relations Officer (PRO), General Hospital, Neyyantinkara

Meeting Information	
Meeting Name/Topic	Meeting with the Public Relations Officer (PRO), General Hospital, Neyyantinkara
Date/Time	30th October 2019, 10:00 AM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Arun Prasanth, PRO, General Hospital, Neyyattinkara.
2	Mr. Sam, Health Inspector, General Hospital, Neyyattinkara.
3	Mr. Dhruv Goyal, Centre for Management Development.
4	Ms. Aishwarya Kuruttukulam, Centre for Management Development
5	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the PRO on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the hospital to capture basic information about the asset and to give the asset users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Basic Asset Details</p> <p>Total area of the asset: 5.6 acres.</p> <p>Mr. Arun mentioned that the hospital which began functioning as a dispensary (December, 1900) was upgraded at various stages- Taluk Hospital (1976), Taluk Head Quarters Hospital (1997), District Hospital (2011), General Hospital (2013).</p> <p>Different Blocks:</p> <p>Mother and Child Health wing</p> <p>OP and IP wing</p> <p>Trauma care and Casualty wing</p> <p>KHRWS pay ward</p> <p>Laboratory wing</p> <p>X Ray wing</p> <p>Janatha pay ward</p> <p>Administrative Building</p> <p>Operation Theatre Block</p> <p>Post-Operative wing and De-addiction center</p> <p>Post-partum Unit</p>

Public Infrastructure

Development & Management

Discussion Points	
3	<p>Facilities and Services Provided</p> <p>ENT, Gynecology, Pediatrics, Orthopedics, General Medicine, Surgery, Postpartum unit, De-addiction Center, Lab facility, NCD Clinic.</p> <p>The hospital provides for 24-hour digital X Ray and Lab facilities. Though Ultrasound scanning facility is available, more advanced scans like CT scan and MRI scan are not available.</p> <p>There are two Operation Theatres (OT's) in the hospital but only one is functional.</p> <p>Field Activities are carried out in 2 wards of the municipality by a Health Inspector, Junior Health Inspector and Female Health Inspector which provides among other services Non Communicable diseases(NCD) care and ante natal care.</p> <p>Monthly Mental Health Clinic is conducted.</p> <p>Mobile Intervention Unit provides services in 4 service areas of physiotherapy, development therapy, special education and audio therapy in the taluks of Neyyattinkara and Parassala. They refer patients to hospitals and also conduct clinics every Monday.</p> <p>Bhoomika center provides assistance in cases of adolescent issues, violence and sexual abuse on the lines of legal aid, treatment, counselling etc.</p> <p>Dialysis unit available and is to be upgraded to 28 units after the MCH building is operational. <i>Annexure 3.153</i></p>
4	<p>Planning:</p> <p>Inefficient space planning:The initial space planning was done without making provision for future expansion. Since its conception in 1900, the hospital has undergone several upgradations, the latest being the title of General Hospital which was accorded in 2013. Over this period, the hospital has expanded from a single block to currently 11 blocks with the latest being a 5 storey block.</p> <p>As a consequence of this unplanned expansion and upgradation, the blocks are being used for purposes other than for which they were originally designed.</p> <p>There are also connectivity issues between various blocks causing inconvenience to patients and clinicians. For example, the OP wing, IP wing, OT, Labs, X ray unit, post-operative ward etc are all located in separate individual blocks.</p> <p>Moreover, there are inefficiencies in utilizing existing space available. For example: The Mother and Child Health(MCH) wing remains underutilized, with only 2 out of 5 floors (functioning under LT power connection) being used due to power connectivity issues.</p> <p>Delay in obtaining High Tension power connectivity (approximately 2-3 years' delay in funding and 2 years' delay in other ground works such as tendering) has led to non-optimum utilization of available resources.</p>

	<p>There is also lack of space for parking vehicles of doctors and patients due to multiple buildings.</p> <p>Bed capacity: According to Mr. Arun, the hospital has a sanctioned bed strength of 436 beds, but currently caters on an average to over 450 patients per day and works beyond full occupancy.</p>
5	<p>Design:</p> <p>The disconnected nature of planning has impacted the design of the hospital. Moreover, it is noted that:</p> <p>The best-in-class hospital design guidelines were not followed.</p> <p>The different blocks in the hospital were designed in silos. This is led to several inefficiencies. For example: Each building/ block has its own waste management practices even though waste water treatment facilities exist in the hospital.</p> <p>Adequacy of Infrastructure/Furniture: Due to lack of proper planning and hurried construction, facilities like ramp, fire and safety measures, HT power supply, water connection etc. were unavailable in the MCH building, even though the building is currently being utilized. Steps are being taken to resolve this.</p>
6	Procurement: N/A
7	<p>Construction:</p> <p>It was mentioned that all major construction works are carried out by the PWD (with funds provided by the health department) while minor alterations/ maintenance activities are handled by the Jilla Panchayat.</p>
8	<p>Operations and Maintenance (O&M):</p> <p>The maintenance activities are undertaken by the PWD as well as the local self-governments.</p> <p>Electrical: With multiple constructions over the years, there are seven electricity connections in the hospital which creates difficulties in maintenance. This is now being consolidated into an integrated connected load of 401.394 kW.</p> <p>Major Electric works like the HT connectivity are undertaken by the KSEB through tenders.</p> <p>Minor works in electrical section are carried out by in house employees.</p> <p>Works are currently going on for setting up of HT power supply and is expected to be completed in one week's time.</p> <p>Plumbing:</p> <p>Major civil works (plumbing, electricity) are carried out by the Assistant Engineer at Jilla Panchayat level.</p> <p>Minor works in plumbing section are carried out by in house employees (contract workers).</p>

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Development & Management

	<p>Other Maintenance:</p> <p>The over and under bed maintenance is undertaken by an in-house team under Mr. Sam, Health inspector of the hospital.</p> <p>There is color coding of linens on a daily basis in the hospital wards to ensure daily upkeep and hygiene.</p>
9	<p>Miscellaneous</p> <p>Personnel Management:</p> <p>The institution is headed by the Medical Superintendent (MS) with clinical and administrative wings coming under the office.</p> <p>The management of the hospital and major decision making is undertaken by the Hospital Management Committee (HMC), comprising of members of the Jilla Panchayat, MS, citizens, elected representatives, NGO representatives, political party representatives, District Medical Officer etc. The meetings of the body are held once in 3 months and also as per necessity in case of emergencies.</p> <p>As seen from the delegation of powers, works for amounts of up to INR 10,000 can be sanctioned by the MS, while works for above INR 10,000 would be approved by the HMC.</p> <p>The hospital faces shortage of manpower with only 248 posts being filled as opposed to a sanctioned strength of 278 posts. There are 30 vacant positions as per June 2019. Also, this sanction of 278 employees was for a Taluk HQ Hospital not for a General Hospital.</p> <p>There is also a shortage of qualified doctors. The doctor to patient ratio is 6-7 doctors for every 3000 patients. This mismatch is more pronounced on peak days like Mondays, when the average wait time is more than an hour.</p> <p>Funds Available:</p> <p>National Health Mission provides funds for specific schemes like AYUSHMAN Bharat, JSSK etc. as well as untied funds according to requests made as per requirements.</p> <p>Funds and supplies from Health Ministry like plan funds, medicines etc.</p> <p>MPLAD and MLA SDF funds.</p> <p>Still, there is shortage of funds to meet Kayakalpa and NQAS accreditation standards.</p> <p>Information Technology:</p> <p>Health Management Information System (HMIS) is updated on a yearly basis and is incorporated with various segments like OP, IP, purchase of assets (funding, year of procurement, model of equipment, manufacturer details) etc.</p> <p>Digital as well as Film X Ray facility is available 24 hours with patients being able to avail facilities on the very same day as the consultation. This facility caters to approximately 150 patients per day.</p>

	<p>However,</p> <p>There is lack of coordination between soft wares like e-Swasthya and e-Health Telemedicine facilities like e-Dhanuanthari are only being utilized for tele-radiology. No digital records are maintained in the pharmacy and allotments are made as per prescription.</p> <p>Purchases:All purchases are supplied from the government approved agencies like the Kerala Medical Services Corporation Ltd. via contracts. Local purchases are made from Nithi Stores and Karunya Pharmacies.</p> <p>Water:The water needs are met by the two wells on the premises, as well as supply by the Kerala Water Authority. A plan for setting up a third bore well is also underway. Uninterrupted water supply has been available for the past two years.</p> <p>The hospital also houses a rain water harvesting system.</p> <p>Waste Management:</p> <p>Biomedical waste segregation and treatment is functional.</p> <p>The food wastes from the kitchen are being treated in a biogas plant in the premises and the gas so obtained is used to cook food in the kitchen.</p> <p>Sewage Treatment Plant is functional with a capacity of 4500 liters/hour.</p> <p>There is also proper segregation and treatment of biomedical wastes</p> <p>However, facilities for solid and plastic waste management are unavailable.</p> <p>Generator facility is available only for the operation theatre, but it is under development for the rest of the hospital and is bound to be operational in 2 to 3 months.</p>
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e. Meeting with the Assistant Engineer (PWD)/Estate Officer, Vikas Bhavan

Meeting Information	
Meeting Name/Topic	Meeting with the Assistant Engineer (PWD)/ Estate Officer, Vikas Bhavan
Date/Time	5 November 2019, 11:15 AM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Zia Noushad, Assistant Engineer (PWD)/Estate Officer, Vikas Bhavan.
2	Mr. Dhruv Goyal, Centre for Management Development.
3	Ms. Sanjana Pothen, Centre for Management Development.
4	Ms. Lekshmi J. H, Centre for Management Development.

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the A. E/Estate Officer on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the office to capture basic information about the asset and to give the asset users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Basic asset details</p> <p>Total area of the asset: N/A</p> <p>Asset constructed in: Dec 1972</p> <p>Total number of offices functioning: 30</p> <p>Total number of staff: 3000 (approximately).</p>
3	<p>Planning and Design:</p> <p>The office complex was designed to accommodate a certain number of offices. However, with new government offices being set up and limited number of government buildings available to accommodate them, Vikas Bhavan has been receiving a number of applications from departments such as LSGD & Backward Class Development Commission for space allocation.</p> <p>The lack of space in government buildings have forced many offices to shift to private spaces which charge INR 1-2 lakhs/month as rent.</p> <p>In order to make available more government office space, PWD is in the process of converting 3 cement godowns into government buildings.</p> <p>The addition of several new offices has eaten up into space available for common facilities such as dining area. For example, recently the dining area on the first floor has been converted into a sub-treasury office.</p> <p>Mr. Noushad also mentioned that even though a lot of space/ land is available with PWD and other government departments, PWD has not been active in putting forth any proposal to utilize the space.</p> <p>It was mentioned that PWD can propose estimates upto INR 6 crores only. Any estimate for an amount higher than INR 6 crore is prepared by the Special Buildings Division.</p> <p>There is lack of adequate parking space for staff as well as visitors even though cellar space has been reserved for parking.</p> <p>Each time a new office is added/ changed; interiors have to be remodeled based upon the staff strength and the requirements of the new departments.</p>
4	<p>Procurement:</p> <p>An asset register (buildings) is maintained manually.</p>

5	Construction: N/A
6	<p>Operations & Maintenance:</p> <p>PWD has three building divisions in Trivandrum:</p> <p>Regular Building Division.</p> <p>Special Buildings Division.</p> <p>Maintenance subdivision (only for Trivandrum. In other areas, maintenance is undertaken by the Buildings Division).</p> <p>There is a Running Maintenance Contract for PWD buildings (not for other department buildings) for 6 months to undertake regular maintenance work (one contractor per building).</p> <p>PWD also undertakes estimate preparation for maintenance work of other departments on request. This is done on the condition that the department transfers funds to PWD.</p> <p>Steps in undertaking maintenance work:</p> <p>Proposal/Request for maintenance work received from the department.</p> <p>Site inspection by PWD officials (1-2 days).</p> <p>Estimate preparation (takes minimum 1 week). The AE sends the same to the EE who sends it to other departments.</p> <p>Fund transfer by the concerned department to PWD account.</p> <p>Tendering procedure (A sum below 15 lakhs is done by the AE, 15 lakhs and above is done by EE and SE).</p> <p>Commencement of work (within one month of tendering).</p> <p>With PRICE software, this process can be carried out without delays.</p> <p>There is poor maintenance of old buildings. For example, PWD has built two staff quarters for non-gazetted officers in 1948 which is single storied and is in poor condition. As a solution, Mr. Noushad suggested demolition of old quarters and construction of new multi storied buildings.</p> <p>Specific to Vikas Bhavan</p> <p>Many of the estimates for carrying out maintenance work is not carried out due to lack of funds. For example: An estimate of INR 75 lakhs for painting work has been submitted 2-3 months back. This has not showed much progress.</p> <p>Water: The complex faces water shortages from time to time.</p> <p>Electricity: Generator back up is available independently for different offices (not for the whole building).</p> <p>Waste Disposal:</p> <p>There is an incinerator for solid waste management.</p> <p>However, there is no system for treating liquid waste (it is connected to the public sewerage system).</p>

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7	<p>Miscellaneous information</p> <p>Use of Information Technology:</p> <p>The practice of writing bills manually is being gradually changed to an e- measurement book. For all the work getting Technical Sanction (T. S) after June 2019, measurements are to be given in the e measurement book.</p> <p>E-office is not introduced yet in the office.</p> <p>PRICE Software: The office has been given a deadline of Nov 10 to upload all asset details on PRICE software. As of now, all the estimates are being prepared on the software itself. The office is also looking at entering details of billings in the PRICE software so that all works undertaken are accounted for.</p> <p>However, there is no updation of new assets added such as by the electrical division or modifications to existing assets such as false ceiling, LED etc even in the PRICE software.</p> <p>Allocation of space: The allocation of space for an office in the Vikas Bhavan complex is undertaken by the Estate Committee (chaired by Director of Industries and Commerce, Mr. Biju IAS). The Estate Committee meets every 3-4 months and decides on space allocation.</p>
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f. Expert Group (EG) Meeting to Review the Study

Meeting Information	
Meeting Name/Topic	Expert Group (EG) Meeting to Review the Study
Date/Time	8 November 2019, 2:30 PM

Meeting Attendees	
Sl. No.	Attendees
1	Ms. Sheela Thomas IAS (Retd.), Member Secretary, Administrative Reforms Commission
2	Ms. Minimol V. G., Additional Secretary, Administrative Reforms Commission
3	Mr. C. J. Suresh Kumar, Under Secretary, Administrative Reforms Commission
4	Mr. Pradeep V. R, Asst. Section Officer, Administrative Reforms Commission
5	Mr. Joy N. R., Chief of Industries and Infrastructure Division, Kerala State Planning Board
6	Ms. Beena L., Chief Engineer (Roads and Roads Maintenance), PWD
7	Dr. B. G. Sreedevi, NATPAC
8	Mr. Wilson K.C., Scientist, NATPAC
9	Dr. R. Satheesh Chandran, Government Engineering College, Barton Hill
10	Mr. P.B. Sajan, COSTFORD
11	Mr. Biju S. Narayan, Centre for Management Development

12	Mr. Dhruv Goyal, Centre for Management Development
13	Ms. Abhilasha Jain, Centre for Management Development
14	Ms. Sanjana Pothen, Centre for Management Development
15	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The purpose of the Expert Group (EG) meeting was to review the progress of the asset study undertaken by Centre for Management Development (CMD), review progress of the study/studies not under the ambit of CMD and fix the timelines for submission of final report by the Study team.
2	<p>Timelines and Contract Details</p> <p>The timelines for submission of report were mentioned by Mr. Suresh Kumar:</p> <p>Date to conclude discussions with the key stakeholders such as KSTP, KSCC, Police Housing Corporation, KSEB, KWA, TRIDA etc - 31 December 2019.</p> <p>Meeting with various departments like Local Self Government, Health, PWD and Social Justice: to be concluded before 15 January 2020.</p> <p>Date for submission of draft report by CMD - January 31, 2020.</p> <p>Submission of report by ARC to the government - February 15, 2020.</p> <p>The Member Secretary mentioned that the Work Order and associated payments for CMD will be issued soon.</p>
3	<p>Observations on the study so far</p> <p>The CMD team made a presentation to the Expert Group members outlining their scope of study, assets visited till date, detailed observations during the visits as well as next steps to be taken. The comments of the members are mentioned below:</p> <p>Planning</p> <p>There was consensus among the members that lack of stakeholder consultation was a key reason for delays and cost overruns in the planning and DPR preparation phase.</p> <p>For example, while deciding the location of a school, demographic aspects such as population as well as other aspects such as pollution, proximity to roads etc which are important for safety of students are not considered.</p> <p>Moreover, fund allocation for DPR preparation is limited as compared to the efforts needed to prepare a comprehensive DPR. It was noted by the Study team that as most of the assets visited were constructed 20-30 years back, availability of DPR/ Feasibility Reports were limited.</p>

	Discussion Points
	<p>The availability of such information with PWD is also limited as most projects have only structural drawings and estimates. DPR preparation is a more recent phenomenon and often the same DPR's are replicated across projects.</p> <p>Design</p> <p>The members noted that another issue is the lack of adherence to/enforcement of guidelines during design and construction phase.</p> <p>One reason for this can be the frequent upgradation of norms from time to time, which results in the building not adhering to the norms eventually. For example: National Building Code, Disaster Resilience norms etc.</p> <p>Many codes have come up subsequent to the construction of the asset. For example: Green Building norms which are a crucial factor in ensuring energy efficiency and sustainability of buildings have come up after 2000's.</p> <p>The DPR's for new assets should take all this into consideration in the preparation phase itself.</p> <p>Another factor is the design capability of the Study team. In most cases, while evaluating the designs of the consultant, aspects such as adequacy, user friendliness and energy efficiency of the buildings are not evaluated. Thus, it was agreed that there is a need to evaluate the designs more closely.</p> <p>Contracting</p> <p>While preparation of comprehensive bid and contract documents require specialized skill, it was noted by the Study team that most contracts are drafted by individuals who lack formal training in the same.</p> <p>Another reason for delays is that the shift from administrative control to contractual control after the advent of PPP's have not been accompanied by changes in government processes and systems. This affects accountability.</p> <p>Construction</p> <p>In terms of construction, most projects fail to have a master plan which can aid in expansion over the next 10-20 years. Such a long term outlook is needed while constructing most assets especially schools and hospitals.</p> <p>The master plan, once put in place can be altered as per the budget and stakeholder needs from time to time.</p> <p>Moreover, several issues during the construction phase can be solved by improving the quality of the bid document.</p> <p>Operations and Maintenance (O&M)</p> <p>In terms of O&M, successes in most cases are temporary as they depend upon the personality of the head of the institution.</p>

Discussion Points	
	<p>In order to streamline O&M, it should follow standards of service rather than depend upon the nature of the person heading the institution.</p> <p>A member also mentioned that wherever multiple departments are present, common areas are mostly neglected. This was seen from the visit of the Study team to the Vikas Bhavan.</p> <p>Most assets also do not have a daily/weekly/monthly protocol for maintenance activities.</p> <p>It was mentioned that it would be useful to bring in the Building Maintenance Protocol in the recommendations.</p> <p>Making available such information publicly is another way of improving services.</p> <p>CSR funds can also be used to fund O&M activities.</p>
4	<p>Suggested additions to the study</p> <p>It was mentioned that the following could be added into the report:</p> <p>Quality control as part of the asset value chain.</p> <p>Adherence to standards such as energy efficiency of buildings, ventilation aspects, disaster resilience etc.</p> <p>Low cost constructions/sustainable assets (This can help in comparing maintenance costs of regular buildings with such sustainable buildings).</p>
5	<p>Next Steps</p> <p>For the assets studied in Trivandrum district, Detailed Project Reports and Feasibility Reports were not available as most of the assets were constructed long back. As a result, in the report, examples to substantiate data points under contracting and construction were not easily available.</p> <p>Hence, it was decided that the would focus on under construction/ recently constructed assets in Kasargode and Wayanad districts so that gaps in contracting and construction phases can be identified better.</p>

g. Meeting with the Superintendent, MahilaMandiram, Kasaragod

Meeting Information	
Meeting Name/Topic	Meeting with the Superintendent, MahilaMandiram, Paravanadukkam, Kasaragod.
Date/Time	28 November 2019, 10:30 AM

Meeting Attendees	
Sl. No.	Attendees
1	Ms. Geethakumari, Superintendent, MahilaMandiram

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2	Ms. Syamala U, Matron (Grade 1), MahilaMandiram
3	Ms. Kala P. P, Office Attender, MahilaMandiram
4	Mr. C J Suresh Kumar, Under Secretary, Administrative Reforms Commission
5	Mr. Dhruv Goyal, Centre for Management Development
6	Ms. Abhilasha Jain, Centre for Management Development
7	Ms. Sanjana Pothan, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the Superintendent on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the office to capture basic information about the asset and to give the asset users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Basic asset details</p> <p>The MahilaMandiram was earlier housed within the Children's Home which is an adjacent property maintained by the Social Justice Department. With the creation of the new Women and Child Development department, the MahilaMandiram which was earlier a part of the Social Justice department was shifted into a new 50 cent plot.</p> <p>Total area of the asset: 50 cents (Building constructed in 12 cents).</p> <p>Asset handover after construction: 1 April, 2016 (Foundation stone was laid in 2011).</p> <p>Maximum inmate capacity: 25</p> <p>Current occupancy: 20</p> <p>Age of inmates: between 18-60 years.</p> <p>Sanctioned staff strength: 5 (1 Superintendent, 1 Matron, 1 Office Attender, 1 multi-tasker, 1 lawyer)</p> <p>Total number of staff: 5 excluding Matron</p>
3	<p>Planning and Design Stage</p> <p>No inputs were provided on this phase of the value chain as the asset was handed over 4-5 years back and the documentation was not available.</p>
4	<p>Procurement:</p> <p>No inputs were provided on this phase of the value chain as the asset was handed over 4-5 years back and the documentation was not available.</p>
5	<p>Contracting:</p> <p>Two contractors were involved in undertaking the work of the building.</p>

Discussion Points	
	<p>The initial contract which was for a sum of INR 85 lakhs was not sufficient to finish the building. Though the building work commenced in 2011, the time period was extended twice and the actual work was completed only by October 2012.</p> <p>Since additional work was required, a second contract for an additional sum of INR 82 lakhs was entered into for completing the project. The AS for this was received on July 5, 2013 and the Completion certificate was issued in March 2015.</p>
6	<p>Construction:</p> <p>After laying the foundation stone in 2011, the construction was delayed by two years due to fund shortage. The construction activity which commenced in 2013, was completed only in 2016.</p>
7	<p>Operations & Maintenance</p> <p>For undertaking any maintenance activity, the Superintendent has to send a request to PWD. PWD undertakes the work once the funds for the same are sanctioned by the Social Justice department.</p> <p>A maintenance proposal for painting, procurement of additional furniture etc amounting to INR 20 lakhs was sent to PWD on Feb 7, 2019. PWD submitted an estimate on June 24, 2019 and the funds for the same have been sanctioned by the Social Justice department recently. This was conveyed to the Superintendent only through a phone call. No official communication has been received from the department.</p> <p>Though the building was handed over only in 2016, the Superintendent pointed out that there are issues in wiring, switches, flushes and tube lights.</p> <p>Additional fund sanction is needed for roofing, flooring and renovating the kitchen.</p>
8	<p>Miscellaneous information</p> <p>Inmates:</p> <p>The facility is meant to house victims of POCSO cases, financially backward and destitute women. In addition, girls under the age of 18 whose parents are financially backward also stay here. The Mahila Mandiram takes effort to marry such girls off through funds obtained from voluntary contributions and donations.</p> <p>The inmates stay for an average period of 2-3 years. Most of the women involved in cases are released once the case is finished. However, if the family of the person wants to take them back, they are permitted to do so.</p> <p>Every month, the Superintendent reports to the Jilla office on inmates and their details, who forwards the same to the Directorate.</p> <p>Food is prepared by the inmates themselves. The superintendent emphasised on the need for appointing a cook as currently the inmates spend a considerable amount of time</p>

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Discussion Points	
	<p>on it. Further, she also pointed out that there is no stove and the kitchen is in need of maintenance.</p> <p>Provisions are bought from the department store in bulk.</p> <p>Finance:</p> <p>Yearly allocation of funds from the user department: INR 4 lakhs, which can be used for food, clothing, medicines, vehicle charges and so on.</p> <p>A Management Committee (MC) which consists of Block Panchayat President, Jilla Social Justice officer, Probationary officer, superintendent and women officer meets once in 3 months. The funds of the MC come solely from donations.</p> <p>Since the MahilaMandiram is a transferred institution of the Block Panchayat, any immediate needs such as utensils, bed etc are met by the Block Panchayat.</p> <p>The superintendent pointed out the lack of an imprest/rolling fund. Any amount required for routine activities are spent out of pocket/on credit.</p> <p>For attending to the medical needs of the inmates, a homeo doctor visits once a month. In addition, there is also an ayurveda hospital nearby.</p> <p>There is rainwater harvesting facility within the compound, but since the piping network is not connected to the roof, effectively no rainwater harvesting takes place.</p> <p>Solid waste is disposed through burning.</p>

h. Meeting with the Civil Police Officer (CPO), Badiyadukka

Meeting Information	
Meeting Name/Topic	Meeting with the Civil Police Officer (CPO), Badiyadukka, Kasaragod
Date/Time	28 November 2019, 1:00 PM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Sreeraj, Civil Police Officer, Badiyadukka Police Station
2	Mr. Satheep, Civil Police Officer, Badiyadukka Police Station
3	Mr. Ramakrishnan, Writer, Badiyadukka Police Station
4	Mr. C J Suresh Kumar, Under Secretary, Administrative Reforms Commission
5	Mr. Dhruv Goyal, Centre for Management Development
6	Ms. Abhilasha Jain, Centre for Management Development
7	Ms. Sanjana Pothan, Centre for Management Development
8	Ms. Lekshmi J. H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the CPOs on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the office to capture basic information about the asset and to give the asset users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Basic asset details</p> <p>The old building was inaugurated in 1955 (constructed by PWD).</p> <p>The police station is now housed in a new building constructed by Kerala Police Housing and Construction Co-operation Ltd (KPHCC) which was inaugurated on 12 January, 2004.</p> <p>Jurisdiction: Serves 12 villages.</p> <p>Area of the asset: 38 cents.</p> <p>Average number of petitions per month: 55 (Out of these, approximately 20 get registered as FIR).</p> <p>Average number of cases per month: 50</p> <p>All building related information for police stations can be received from the District Police Chief's (DPC) office.</p>
3	<p>Planning and Design Stage</p> <p>Lack of visiting room for citizens.</p> <p>Lack of adequate space: For example, the women's resting room is now used as the Sub Inspector's room.</p> <p>No restroom for police officers. This is more relevant in the case of night duty staff who requires resting space after duty.</p> <p>It was observed that the officers had constructed a makeshift facility that can be used as a restroom.</p>
4	<p>Procurement:</p> <p>It was mentioned that a Permanent Account amount of only INR 1625 is available which has to be used for activities such as food and hospital expenses of the accused.</p> <p>It was also mentioned that the supplies allocated such as A4 papers and toner refills were often insufficient and hence was procured at the expense of the officials.</p>
5	<p>Contracting:</p> <p>As the building was constructed in 2004, relevant details regarding the contracting process was not available.</p>

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6	<p>Construction:</p> <p>The asset was created by KHPCC. Since the building was constructed in 2004, relevant information regarding the construction was not available.</p>
7	<p>Operations & Maintenance:</p> <p>A Permanent Advance/Station Contingency Fund of INR 1,625 is provided. Any amount spent from this sum can be recouped from the DPC. For a sum higher than INR 1,625, a request along with quotations has to be prepared and sent to the DPC. The DPC aggregates such requests from all the police stations before sanctioning and supplying the needs of different stations.</p> <p>For undertaking maintenance activity, a request is sent by the police station to the SP (Superintendent of Police) who forwards the same to PHQ (Police Headquarters) in Trivandrum.</p> <p>The CPOs mentioned that no significant maintenance has been undertaken after 2004. However, Plan funds have been utilized for some maintenance activities such as painting (for painting the building green as per new guidelines).</p> <p>Further, funds for maintenance activities such as painting, roofing and construction of compound wall for police quarters are needed. The estimates for these maintenance activities have been sent to the DPC. But the status of these proposals are not known as there are no review meetings. The monthly meeting with the DPC is only meant to discuss crime related matters.</p> <p>It was mentioned by the CPOs that in the absence of administrative staff in the police station, all administrative matters have to be taken up by the police officers themselves.</p> <p>It was also noted that there is no significant maintenance undertaken by PWD on residential staff quarters provided for police officers (as the quarters were constructed by PWD, they provide maintenance services as well). However, for a sanctioned staff of 39 officers, the number of functional quarters is only 10, due to poor maintenance.</p>
8	<p>Miscellaneous:</p> <p>Funds: A Plan fund meeting is organized as and when need arises (mostly annually/half yearly), chaired by the DPC, to discuss matters on how to allocate and spend the plan fund.</p> <p>The 2018-19 Plan fund has sanctioned ramps, disabled friendly toilet, rooms etc. However, work hasn't commenced yet.</p> <p>Purchases: As there are no provisions for localized procurement, this is done in a centralised manner. Supplies such as tables, registers etc., are issued from the DPO store.</p> <p>Sanctioned Posts: IP (1), SI (2), ASI (2), Sr. Civil Police Officer (7), Civil Police Officer (24).</p>

i. Meeting with the Medical Officer (MO), Public Health Centre, Kumbadaje

Meeting Information	
Meeting Name/Topic	Meeting with the Medical Officer, Public Health Centre (PHC)
Date/Time	28 November 2019, 2:30 PM

Meeting Attendees	
Sl. No.	Attendees
1	Dr. Sayed Hamid Shuhaib, Medical Officer (MO), PHC, Kumbadaje.
2	Mr. Gopalakrishnan, Health Inspector, PHC, Kumbadaje.
3	Mr. Rajashekharan, Senior Clerk, PHC, Kumbadaje.
4	Mr. C J Suresh Kumar, Under Secretary, Administrative Reforms Commission
5	Mr. Dhruv Goyal, Centre for Management Development.
6	Ms. Abhilasha Jain, Centre for Management Development
7	Ms. Sanjana Pothan, Centre for Management Development
8	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the Medical Officer on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the office to capture basic information about the asset and to give the asset users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Basic Information</p> <p>The Public Health Centre, Kumbadaje is one among the PHCs selected for upgradation into Family Health Centre (FHC) under the State Government's "Aardram" project. Since the FHC requires additional facilities and more staff for longer service hours, a new building has been constructed in the same premise for the FHC.</p>
3	<p>Planning and Design</p> <p>The plan of the FHC does not conform to the needs of an FHC. There are a number of rooms on both floors (lodging type) but no wards, conference rooms, outside waiting area (to reduce airborne diseases), compound wall, ramps, separate male and female toilets etc.</p>

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	Discussion Points
	<p>The personnel were unaware if stakeholder consultations took place or if any modifications were made to the plan after such consultation as all the individuals met were posted in the last 3 – 6 months only.</p> <p>Even though the facility has a borewell, there is no apparatus for pumping the water from the borewell for use.</p> <p>Improper design and construction has caused water leakage in the hospital during the rainy season as was witnessed by the constant team during the field visits.</p> <p>The team also reviewed the DPR that was prepared and shared by the on-site team of medical professionals. The DPR was seen to be a rudimentary document with very limited details about the asset.</p>
4	<p>Contracting:</p> <p>The civil works were completed in 2015 but electric works were pending till 2017. This may be because there were two separate contractors for civil and electrical works and there was lack of coordination between the two.</p>
5	<p>Construction:</p> <p>The new building being a transferred institution of the Gram Panchayat, was constructed by the Jilla Panchayat with funds from NABARD under its RIDF (Rural Infrastructure Development Fund) programme.</p> <p>The tender for the project was issued by Executive Engineer, LSGD.</p> <p>The MO mentioned that though the construction of the hospital was completed on 29 December, 2015 by the Zilla Panchayat, it was handed over to the Gram Panchayat only in August 2019. Electrification and plumbing works were undertaken in 2017.</p> <p>There is no power and water connection even after the inauguration. The power connection is not in place yet as the LSGD/ Panchayat has failed to deposit the caution deposit of INR 52,000 to the KSEB to obtain the connection.</p> <p>The construction does not conform with the original building plan: It was seen that there is a deviation between the available plan of the building and the actual construction. Whether the final version of the building plan was modified prior to construction needed verification and such details were not available with the on-site team.</p>
6	<p>Maintenance</p> <p>Routine Maintenance is proposed to be carried out by the Gram Panchayat.</p>
7	<p>Others</p> <p>The PHC caters to 40-60 patients/ day. It provides out-patient (OP) services only.</p> <p>The PHC has 5 local sub centres which provide immunization services. But these centres lack electricity.</p> <p>The premises lacks a proper compound wall which has security implications.</p>

	Discussion Points
	<p>Funding:</p> <p>National Health Mission provides a fund of INR 14 lakhs for up grading the PHC to a FHC. This fund will be used for procurement of lab equipment, furniture etc.</p> <p>Excess requirement of funds will be met by the Gram Panchayat under which the PHC functions.</p> <p>Funds from MPLAD and MLA SDF schemes.</p> <p>It was mentioned that a yearly summary of requirements is given to the Gram Panchayat, which is met according to fund availability.</p> <p>The Hospital Management Committee (HMC) can sanction emergency funds amounting to 50% of the fund available with the Committee. This fund is funded by revenues from the OP ticket fee of INR 5 collected from the patients. Currently the fund amounts to INR 40,000.</p>

j. Meeting with the Head Master, Government Vocational Higher Secondary School, Delampady

Meeting Information	
Meeting Name/Topic	Meeting with the Head Master, Government Vocational Higher Secondary School, Delampady, Kasaragod
Date/Time	29 November 2019, 12:00 PM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Ramanna, Head Master, Government Vocational Higher Secondary School
2	Mr. Dhruv Goyal, Centre for Management Development
3	Ms. Abhilasha Jain, Centre for Management Development
4	Ms. Sanjana Pothen, Centre for Management Development
5	Ms. Lekshmi J. H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Head Master on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the office to capture basic information about the asset and to give the asset users a context of the study.

	Discussion Points
	The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:
2	<p>Basic asset details</p> <p>Year of establishment: 1920</p> <p>Total area of the school: 2 acre and 41 cents.</p> <p>Medium of instruction: The school was originally Kannada medium. Malayalam was added as an additional medium in 1975.</p> <p>Total number of students: 548. (Classes 1-7 are under Gram Panchayat while classes 8-10 are under District Panchayat).</p> <p>Vocational courses offered: At present only Computer science (from Standard XI onwards) is being offered.</p> <p>Total staff strength: 33 (1 Head Master, 26 primary school teachers, 7 high school teachers, 2 office assistants, 2 cooks).</p> <p>Yearly staff fixation is based upon number of students.</p> <p>Total number of classrooms: 30 of which 20 are currently functional and 10 are yet to be constructed.</p>
3	<p>Planning and Design Phase</p> <p>Planning based on fund availability: The primary issue seemed to be that the planning is based on the fund available in a particular year rather than funding linked to an overall 3-5 year plan. The District Panchayat allocates a certain amount to all schools from the total funds earmarked for education by the local self- governments in a year. The planning is to be done using this allocation. However, in most cases, this fund is not sufficient to meet the plan requirements of the school.</p> <p>It was mentioned that the school authorities, PTA etc., were not consulted in the planning and design phase of the buildings. Requirements are submitted on a yearly basis to the Panchayat and allocations are made as per fund availability under various schemes.</p> <p>It was mentioned that proposals and requests regarding requirements are usually made to the District Panchayat, ward member or MLA. But periodic meetings or mandated procedure for such meeting were lacking. Hence there is no mechanism for effective follow up.</p> <p>Moreover, there is no lump-sum/consistent fund allocation by the District Panchayat over the years. This makes it difficult to complete projects in one go.</p> <p>For example, in a particular year, the District Panchayat may allocate funds for construction of the first floor of a building followed by no fund allocation in the next two years.</p>

	Discussion Points
	<p>By the time the next allocation is received, the District Panchayat would have pre-planned the designs which lead to construction of a new building instead of vertical expansion of existing buildings.</p> <p>The Head Master also mentioned that alterations in the plans were not possible once the project has been contracted.</p> <p>The schools are reluctant to raise objections to plans prepared by the District Panchayat, as funds might lapse/be transferred to another school by the Panchayat if not utilized before the end of the year.</p> <p>In some cases, reason such as low strength of the foundation is cited for not constructing multi-storied buildings. As a result, though most of the buildings in the school have pillars for additional floors, they are left with just one floor.</p> <p>This was evident in the school as the visiting team saw several disconnected classrooms, each constructed in a separate year as funds were available for the construction of only one classroom in the given year.</p>
4	<p>Procurement:</p> <p>All procurement processes for the school are managed by the Gram / District Panchayats. The construction is handled by the LSG Department.</p> <p>The school principal does not have any imprest amount for petty purchases.</p>
5	<p>Contracting:</p> <p>Separate contracts were awarded for civil and electrical works of the new building. This has led to completion of the new building (civil) without installation of any electrical fittings.</p>
6	<p>Construction:</p> <p>On the request of the PTA President to the District Panchayat, two new buildings have been tendered by District Panchayat at a cost of INR 65 lakhs. These buildings consist of science labs, computer labs, art and culture room, library room and a Vishranthi (resting room) for girls.</p> <p>Though civil works have been completed, electrical and plumbing works are pending.</p> <p>The Head Master mentioned that the stakeholders have limited capacity to intervene in the construction work as the work is tendered by the District Panchayat.</p>
7	<p>Operations & Maintenance:</p> <p>It was mentioned that due to lack of space and delay in inauguration library, cultural lab, science lab etc., are being housed in existing classrooms.</p> <p>Maintenance is carried out using funds from the District Panchayat and PTA (Parent Teachers Association). The PTA fund is not collected from students of 1-8th standard. However, voluntary contributions are accepted.</p>

Public Infrastructure
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	Discussion Points
	<p>For maintenance activities undertaken using funds from District Panchayat, the following procedure is followed:</p> <p>Submission of request to District Panchayat.</p> <p>Site visit by overseer/Junior Engineer.</p> <p>Preparation of the estimate.</p> <p>Estimate handover to District Panchayat.</p> <p>District Panchayat sanctions the request if funds are available, otherwise it is kept pending.</p> <p>Since the process mentioned above takes long (an average of 1-2 years), any immediate fund requirement is met through PTA funds as the Head Master does not have any imprest amount for such urgent requirements.</p> <p>Electrical: All maintenance activities of computers are undertaken by KITE. Complaints can be raised online and the KITE staff will visit the premises in 2-3 days for repair.</p>
8	<p>Miscellaneous:</p> <p>Sources of funds:</p> <p>Gram Panchayat.</p> <p>District Panchayat: Received INR 6,50,000 in F. Y 2018-19.</p> <p>MPLADs and MLA SDFs.</p> <p>VidyabhyasaSamrakshana Yojana: INR 1 crore has been sanctioned for school infrastructure (but not received till date).</p> <p>Sarva Shiksha Kerala: provided INR 37,500 as grant in the previous year for activities such as library, drinking water, beautification and minor maintenance.</p> <p>Donations and voluntary contributions: for buying periodicals, books etc.</p> <p>PTA membership fees collected from parents.</p> <p>Governance:</p> <p>The principal (head of the school) reports to the DDE (Deputy Director of Education) who further reports to the DGE (Director General of Education). The focus of the DDE meetings are mostly on administrative matters and takes place once in a quarter.</p> <p>There is also a monthly/ bi-monthly meeting with the DEO (District Education Officer) to discuss academic matters and students problems.</p> <p>Any other problems are reported to the Ward member, President or Secretary of the District Panchayat.</p> <p>There is also a School Management Committee (SMC) as well the PTA (Parent Teacher Association).</p> <p>Water: There is a well and a bore well in the premises.</p> <p>Waste: Solid waste is burnt while liquid waste is disposed through septage.</p>

K. Meeting with the Sub-Registrar, Manjeshwaram

Meeting Information	
Meeting Name/Topic	Meeting with the Sub-Registrar (SR), Manjeshwaram
Date/Time	29 November 2019, 3:30 PM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Robin D' Silva, Sub-Registrar, Sub-Registrar Office (SRO), Manjeshwaram
2	Mr. Sudheep, Head Clerk, Sub-Registrar Office (SRO), Manjeshwaram
3	Mr. Kishan Raj, Clerk, Sub-Registrar Office (SRO), Manjeshwaram
4	Mr. Dhruv Goyal, Centre for Management Development.
5	Ms. Abhilasha Jain, Centre for Management Development
6	Ms. Sanjana Pothen, Centre for Management Development
7	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	<p>The meeting commenced with a brief introduction being given to the Sub Registrar (SR) on the objectives and scope of the study. Prior to the visit, a questionnaire was sent out to the office to capture basic information about the asset and to give the asset users a context of the study.</p> <p>The meeting was structured along the typical asset value chain which starts from Planning till Operation & Maintenance. The main points of discussion are detailed below:</p>
2	<p>Planning and Construction Stage:</p> <p>The building which is currently in use was constructed in 1884 by PwD. A new building has been completed and is to be inaugurated in December after completion of some minor works.</p> <p>The new building has been planned after making provision for increased citizen footfall. The SRO mentioned that the new building should suffice for the next 100 years.</p> <p>Area of the new building: 3500 sq. ft.</p> <p>Average citizen footfall per day: 150</p> <p>Timeline of Planning and Construction</p>

	Discussion Points
	<p>The initial request for the building was made on 29 September 2007, following which an estimate of INR 50 lakhs was prepared on 21 June 2010.</p> <p>This estimate was cancelled on 19/May/2012 as the estimated amount was found to be insufficient to meet the requirements of the building.</p> <p>A second estimate of INR 76 lakhs was prepared on 3 October 2016. Subsequently communication between the Sb-Registrar Office and the Executive Engineer, PWD Kasargode took place on 10 June 2015 and 6 January 2016.</p> <p>Administrative Sanction was provided on 27 March 2017.</p> <p>Construction Sanction was provided on 22 September 2017.</p> <p>Construction began in November 2017 and was completed by June 2019.</p> <p>Though there has been considerable delay in construction, the building was constructed without cost overruns. Mr. D' Silva mentioned that though the total sanctioned amount was INR 78,44,000, the construction was completed at a cost of INR 70,00,000.</p> <p>The electricity connection for the new building is being delayed as the old connection has to be shifted to the new building.</p>
3	<p>Design Stage:</p> <p>It was mentioned that adequate stakeholder consultation was carried out during the design and construction phase of the asset. The initial plan was revised as per the needs of the asset users after consultation. This has ensured that adequate facilities such as waiting area, toilets, ramps for the disabled, sufficient storage space for records etc. have been provided for.</p>
4	<p>Contracting:</p> <p>There were two separate contractors for civil and electrical works. Both works have taken place as per plans and no significant delays were noted in the completion of works.</p>
5	<p>Maintenance:</p> <p>Maintenance works for the new building is to be undertaken based on request to be made to the District Registrar. Funds will be sanctioned for the same in accordance with the available funds.</p> <p>The office has requested for solar panels and repairs to the compound wall on 4 February, 2019 to the District Collector, Kasargode. This is expected to be sanctioned based on fund availability.</p> <p>A permanent advance of only INR 25 is available with the registrar for contingency purposes. This has not been revised since long and hence the devolution of the financial power to the Sub-Registrar remains minimal.</p>

	Discussion Points
6	<p>Miscellaneous:</p> <p>The sanctioned manpower in the office comprises of:</p> <p>1 Sub Registrar</p> <p>1 Head Clerk</p> <p>3 Senior Clerks</p> <p>2 Clerks</p> <p>1 Office Assistant</p> <p>1 Part-time Sweeper</p> <p>Though the office requires mandatory night watch, this is done by the Office Assistant itself as is the case in other government assets.</p> <p>The building has rain water harvesting facility.</p> <p>Small scale organic farming and gardening is also carried out in the premises under the initiative of the Sub-Registrar.</p>

1. Meeting with the Public Relations Officer, Government Taluk Headquarters Hospital, Sultan Bathery

Meeting Information	
Meeting Name/Topic	Meeting with the Public Relations Officer (PRO), Government Taluk Headquarters Hospital, Sultan Bathery
Date/Time	13 December 2019, 11:30 AM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Anish Kuriakose., PRO, Government Taluk Headquarters Hospital, Sultan Bathery
2	Mr. Dhruv Goyal, Centre for Management Development.
3	Ms. Abhilasha Jain, Centre for Management Development
4	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points																			
Sl. No.	Discussion Points																		
1	The meeting commenced with a brief introduction being given to the PRO on the objectives and scope of the study. The main points of discussion are detailed below:																		
2	<p>Planning and Construction Stage</p> <p>Total area of current premises: 5.5 Acres.</p> <p>Total constructed area of Mother and Child wing (planned): 6,000 sq. ft.</p> <p>It was mentioned that the initial hospital was constructed in 1915. Due to lack of facilities and area for further expansion, the hospital was shifted to the current premises called the Fairland block in 2008.</p> <p>The hospital comprises of the following blocks:</p> <p>IP Block (two-storey)</p> <p>OP Block (five-storey)</p> <p>Mother and Child Wing (under construction)(seven-storey)</p> <p>X-Ray Wing</p> <p>Dialysis Unit</p> <p>Blood Bank</p> <p>Post Mortem Mortuary</p> <p>Details of the various blocks are listed in the table given below:</p> <table> <tr> <th>Building</th><th>Year of construction</th><th>Funding Agency/ Scheme</th><th>Allocation</th><th>Constructing Agency</th></tr> <tr> <td>IP Block</td><td>2008</td><td>Block Panchayat, Sultanbathery</td><td></td><td>Assistant Executive Engineer, Local Self Government Department (LSGD)</td></tr> <tr> <td>OP Block</td><td>2015-present (Expected completion: March,2020)</td><td>Building: Multi-sectoral development program (MSDP) Equipment and Accreditation: National Health Mission (NHM)</td><td>INR 19.68 Crore (MSDP) INR 5 Crore (NHM)</td><td>Buildings, Public Works Department (PWD), Sultanbathery</td></tr> </table>				Building	Year of construction	Funding Agency/ Scheme	Allocation	Constructing Agency	IP Block	2008	Block Panchayat, Sultanbathery		Assistant Executive Engineer, Local Self Government Department (LSGD)	OP Block	2015-present (Expected completion: March,2020)	Building: Multi-sectoral development program (MSDP) Equipment and Accreditation: National Health Mission (NHM)	INR 19.68 Crore (MSDP) INR 5 Crore (NHM)	Buildings, Public Works Department (PWD), Sultanbathery
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Discussion Points					
	Mother and Child Wing	2019- present	NABARD	INR 25 Crores	Special Buildings, PWD, Kalpetta
	Dialysis Unit	2014-2019	MSDP (Building) KIIFB Fund (Equipment)		
	Blood Bank	2014-2019	NHM	INR 2.27 Crores	
	X-Ray Unit	2014-2019			
	Post Mortem Mortuary	2014-2019			
	Sewage Treatment Plant	2019	Block Panchayat Suchitwa Mission	INR 1 Crore	DPR: Ram Biologicals Construction: Green Methods Engineering Ltd.

The initial proposal for the Mother and Child wing was made in June 2012. The following timeline was established according to the various details obtained from the hospital:

2/June/2012 – Proposal for 200 bed facility send to Additional Director of Health Services. The estimate amount was INR 8 Crore for the building and INR 5 Crore for the equipment.

25/June/2012 – Approval received from Director Health Services to District Medical Officer (DMO).

23/Jan/2013 – Request for upgradation to Women and Child Hospital sent from MS to DMO.

25/March/2013 - An amount of INR 3 Crore sanctioned for civil works.

31/Aug/2013 - Stakeholder meeting held.

5/Sep/2013 – Plan prepared.

7/Sep/2013 - Modified plan submitted by Assistant Engineer (PWD) to MS.

9/Sep/2015 - Proposal submitted by Superintending Engineer(SE) PWD to Chief Engineer (CE) PWD stating that the estimate amount is insufficient and an additional fund of INR 20 Crore is required.

16/Sep/2015 - New estimate submitted by MS to DMO.

1/Dec/2015 - Revised estimate of INR 25 Crore submitted by AEE, PWD to EE, PWD.

Discussion Points	
	<p>21/Oct/2016 - Update on Land Acquisition and Progress report requested by DHS to DMO</p> <p>22/Oct/2016 - Status update by DMO to DHS that the project has been submitted for NABARD Approval for funding.</p> <p>19/Feb/2018 - Site handover from DMO to EE, PWD.</p> <p>15/Sep/2018 - Request for permission to begin construction send from MS to DMO.</p> <p>Jan/2019 – Start of Construction.</p> <p>From the timeline it can be seen that considerable delay was caused due to lack of sufficient planning and as well as inadequacy of estimate preparation and funding.</p> <p>The construction of the hospital complex lacked a master plan at all phases of expansion.</p> <p>The already constructed structure in the OP Block is currently being reworked due to lack of initial stakeholder consultation.</p> <p>The consequences of this can be observed by the fact the Operation Theatre had to be redesigned to include separate doors for taking to the patient into and out of the room as per National Quality Assurance Scheme (NQAS) standards.</p> <p>This was also seen in the case of the walls of the X-Ray room which lacked sufficient thickness as per standards followed in India.</p> <p>Lack of adequate planning is also a factor in the above rework as it is being done to adhere to NQAS Standards. Change in requirement of the designated area is also a factor.</p> <p>Once the renovation being undertaken in the current OP wing is completed, it would be converted into the IP block. The IP wing(two-storey) will be used for OP and administrative purposes under the Aardram scheme.</p> <p>Currently only 3 floors are fully functional in the six-storey OP building.</p> <p>The renovations planned include laminar flow air conditioning system for operation theatres, centralised medical gas system, casualty block with triage system, isolation wards for patients inflicted with diseases such as cholera, viral diseases, tuberculosis (separate for normal and MDR TB) etc. This is according to requirements issued by the NHM.</p> <p>During the construction phase, even though two lifts were part of the contract, the PWD installed only one due to cost overruns and insufficient funds.</p> <p>The current Mother and Child Hospital will be converted into a facility providing geriatric care, therapy for differently abled children suffering from autism, cerebral palsy etc., and a deaddiction centre.</p> <p>The plans for modification of the hospital are submitted by the Hospital Management Committee (HMC), which comprises of:</p> <p>Block Panchayat President (Chairperson)</p>

Discussion Points	
	<p>Medical Superintendent (MS) of the hospital (Secretary and Convener)</p> <p>representatives of various political parties</p> <p>Health Standing Committee members (Block Panchayat)</p> <p>Ward member</p> <p>Municipal Chairperson</p> <p>Assistant Executive Engineer (AEE), KSEB</p> <p>AEE, KWA</p> <p>AEE, KPWD (Buildings)</p> <p>AEE, KPWD (Electrical)</p> <p>There was a delay in sanctioning and maintenance of vehicles for the hospital.</p>
8	<p>Design Stage</p> <p>An overall master plan and design was absent in the asset creation phase.</p> <p>Adequate consultation with the user departments were undertaken in the design phase of the most recent building.</p> <p>Rework was required in the OP building as the building has not adhered to standards required by NQAS.</p> <p>It was noted that the building lacks ramp facility which is an important requirement for a hospital.</p> <p>The construction and planning of the new Mother and Child wing was in accordance with various guidelines laid down according to NQAS standards.</p>
9	<p>Maintenance</p> <p>The hospital currently has 51 daily wage employees employed by the HMC for maintenance purposes such as civil, plumbing and electrical works, sanitation, security, IT services, parking etc.</p> <p>It was mentioned that maintenance of equipment was carried out by maintenance contracts which are part of the e-tender process.</p> <p>It was mentioned that the fire and safety certification is being completed.</p> <p>A sewage treatment plant (STP) for treating liquid wastes is currently under construction. It was mentioned that the Mother and Child wing will have a separate STP which will be constructed along with the building.</p> <p>It was mentioned that maintenance of various assets such as the STP will be undertaken under the asset maintenance contract (AMC) for the first year.</p> <p>After this period maintenance will be undertaken using the HMC funds.</p>

Discussion Points	
10	<p>Others</p> <p>It was mentioned that the hospital caters to 5 villages of 63.56 sq.km. area.</p> <p>Sanctioned bed strength: 57.</p> <p>Current functional bed strength: 128.</p> <p>Sanctioned manpower is in accordance with the sanctioned bed strength of 57.</p> <p>Planned bed strength on completion of construction as per DPR:</p> <p>OP Block: 220</p> <p>Mother and Child wing: 120</p> <p>Average patient foot-fall:</p> <p>Total: 1200 patients/day</p> <p>IP patients: 123 patients/day</p> <p>No of new admissions: 12 patients/day</p> <p>Even though the current bed strength is sufficient as per the current demands, it was mentioned that the construction of a fully functional mother and child wing will be a constant source of revenue for the institution with income support from state and central government schemes and insurance schemes.</p> <p>It was mentioned that even with gynecology OPs functioning only 2-3 days per week the hospital catered to 148-158 births/month. This is expected to increase with a fully functional Mother and Child hospital.</p> <p>Revenue support of INR 7500/ delivery is currently available under various insurance schemes which will aid in providing free care to the other poor patients.</p> <p>The hospital will cater to the need for Wayanad district of Kerala, Nilgiris district of Tamil Nadu and certain areas of Karnataka due to its easy accessibility.</p> <p>It was mentioned that the Mother and Child wing will comprise of a few wards, nursing stations, labour rooms, one Medical ICU, one Pediatric ICU, four Operation Theatre (OT) Complexes, 1 Gynecology OT etc.</p> <p>It was mentioned that the discussions are going on with Agency for Non-conventional Energy and Rural Technology (ANERT) for implementation of a 200 kW roof-top solar plant which is grid connected. This will not only power the hospital but also act as a source of revenue. The current cost is estimated at INR 1,35,00,000.</p> <p>Funds Available:</p> <p>An average daily income of INR 20,000 is obtained by the issue of OP tickets worth INR Two and IP tickets work INR 15. This is consolidated into the HMC fund.</p> <p>An income of INR 20,00,000 is received per month for various schemes of the state and central government.</p> <p>Block Panchayat provides a sum of INR 10-12 lakhs annually for miscellaneous expenses such as payment of telephone bills, electricity bills, water charges etc.</p> <p>The HMC fund is utilized to pay the wages of the daily wage workers employed for maintenance purposes.</p>

m. Meeting with the Station House Officer, Police Station, Meenangadi

Meeting Information	
Meeting Name/Topic	Meeting with the Station House Officer, Police Station, Meenangadi
Date/Time	13 December 2019, 2:30 PM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Premdas A. S., Sub Inspector (SI), Police Station, Meenangadi.
2	Mr. Prakashan, Assistant Sub Inspector (ASI), Police Station, Meenangadi.
3	Mr. Sabu E. Y., Assistant Sub Inspector (ASI), Police Station, Meenangadi.
4	Mr. Muraleedharan, Civil Police Officer (CPO), Police Station, Meenangadi.
5	Mr. Dhruv Goyal, Centre for Management Development.
6	Ms. Abhilasha Jain, Centre for Management Development
7	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Sub Inspector on the objectives and scope of the study. The main points of discussion are detailed below:
2	<p>Planning and Construction Stage</p> <p>Total area of the premises: 6.5 Cents</p> <p>Total constructed area: 241.90 Sq. metre.</p> <p>Type of Police Station: B</p> <p>Year of construction: 2004</p> <p>Sanctioned manpower at time of construction: 33</p> <p>Current sanctioned manpower: 39</p> <p>The SI mentioned that the building was constructed by the Kerala Police Housing Construction Corporation (KPHCC).</p> <p>The facilities available in the premises were not sufficient at the time of construction and have become increasingly insufficient with the increase in the number of sanctioned posts.</p> <p>The existing premises has been extended at the expense of the officials in order to house offices for Sub Inspectors.</p>

Discussion Points	
	<p>Due to lacking of sufficient spatial planning the following issues are faced:</p> <p>Activities like case taking becomes difficult.</p> <p>Lack of space for housing records of cases.</p> <p>Lack of adequate waiting area for visitors.</p> <p>Lack of parking space for vehicles involved in various cases.</p> <p>Lack of sufficient resting area for officers.</p> <p>The current foundation was not fit for further vertical construction. The lack of space for further expansion of the police station was also mentioned. The officers also mentioned that the current location was apt in terms of accessibility but lacked space for providing for current and future requirements.</p>
3	<p>Design Stage</p> <p>There is no formal communication/ regular dialogue with the asset users during the planning and design stage which leads to several inefficiencies in the usage of the asset.</p> <p>The officers mentioned that the design of the premises is carried out in a centralised manner without stakeholder consultations. It was also seen that there is a lack of a standardized design for the police stations across the state.</p>
4	<p>Maintenance</p> <p>The routine maintenance activities such as security, sanitation, plumbing, civil and electrical works, IT services, parking etc. are carried out through local personnel.</p> <p>The maintenance of movable assets such as vehicles is carried out by the Motor Transport Wing, Kerala Police. It was mentioned that significant delays are seen in the repairs to the vehicles which can adversely affect the official duties. It was mentioned that the officials pay for repairs themselves in urgent situations.</p> <p>Though facilities like generators were provided for power back-up, sufficient funds are not allocated for purchase of fuel.</p> <p>The permanent account was only sufficient for providing for the food, hospital and other need for the accused.</p>
5	<p>Others</p> <p>Direct communication between the immediate users and the implementing agency i.e., the KPHCC was usually not possible as the police department follows a strict hierarchy. Thus effective planning is usually not possible.</p> <p>Though a proposal for a new building was submitted in 2013 it has not been processed yet.</p> <p>The assets provided such as the furniture would be replaced as per requirement upon requests made to the District Police Chief.</p>

n. Meeting with the Principal, Government Higher Secondary School, Vythiri

Meeting Information	
Meeting Name/Topic	Meeting with the Principal, Government Higher Secondary School (GHSS), Vythiri
Date/Time	13 December 2019, 4:30 PM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Mohanan T., Principal-in-charge, GHSS, Vythiri.
2	Mr. Shyam Kumar, Head Master, GHSS, Vythiri.
3	Mr. Sujith Kumar, Higher Secondary School Teacher, GHSS, Vythiri.
4	Mr. Dhruv Goyal, Centre for Management Development.
5	Ms. Abhilasha Jain, Centre for Management Development
6	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Principal on the objectives and scope of the study. The main points of discussion are detailed below:
2	<p>Planning and Construction Stage</p> <p>Total area of the premises: 5.5 Acres</p> <p>Total constructed area: 2,200 Sq. Ft.</p> <p>The Principal mentioned that the latest building in the school premises comprised of 4 classrooms constructed by the Executive Engineer, Local Self Government Department (LSGD). An auditorium was also constructed by the LSGD.</p> <p>The administrative building was constructed by the PWD in 2015 using MLA funds.</p> <p>The Principal mentioned that the decisions regarding the implementing agency of a project are taken by the Governing Council of the Zilla Panchayat. This is usually done depending on the type of fund available.</p> <p>It was seen that one of the major problems faced by the institution is the lack of strong and sufficient compound walls. This has led to safety issues.</p> <p>Adequate planning is required in this regard as the area being located in a hilly area and is subjected to landslides. The principal mentioned that landslides are the most important challenge to the safety of the premises as well as the students.</p>

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Discussion Points	
	<p>The institution lacked an accessible concrete road. It was mentioned that this could lead to connectivity issues.</p> <p>The meetings carried out at the Zilla Panchayat level addressed all matters related to the school from administration to infrastructure requirements.</p>
3	<p>Design Stage</p> <p>The designing was done according to fund availability and requirements requested in the Zilla panchayat meetings.</p> <p>The various constructions carried out in the schools lacked a master plan, and was done according the current fund availability. This was also evident from the design of the school as witnessed by the consulting team.</p>
4	<p>Maintenance</p> <p>The routine maintenance activities such as sanitation, plumbing, electrical works, IT services etc. are carried out by inhouse staff.</p>
5	<p>Others</p> <p>The sanctioned strength of the school incudes:</p> <p>High School: 24 staff</p> <p>Higher Secondary School: 18 staff</p> <p>Though the school has an incinerator, it is not functional and the solid wastes are currently disposed in a dumping site.</p> <p>One of the major concerns mentioned by the officials is regarding the availability of water. The school has a water connection from the Kerala Water Authority as well as a well, but as the quality of water is inadequate installation of a water filter is required.</p> <p>Septage system is being used in the premises.</p>

o. Meeting with the Superintendent, Government Children's Home, Kaniyambetta

Meeting Information	
Meeting Name/Topic	Meeting with the Superintendent, Government Children's Home, Kaniyambetta
Date/Time	12 December 2019, 2:30 PM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Divakaran N. M., Superintendent, Government Children's Home, Kaniyambetta
2	Mr. Vishak M. Chacko, Protection Officer, Institutional Care, Juvenile Justice Department
3	Mr. Muneer, Caretaker, Government Children's Home, Kaniyambetta

4	Mr. Dhruv Goyal, Centre for Management Development.
5	Ms. Abhilasha Jain, Centre for Management Development
6	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Superintendent on the objectives and scope of the study. The main points of discussion are detailed below:
2	<p>Planning and Construction Stage</p> <p>Total area of the premises: 2 Acres</p> <p>Total constructed area: 22,000 Sq. Ft.</p> <p>The Superintendent mentioned that the building in the school premises comprised of 27 rooms constructed by the Kerala Police Housing Construction Corporation (KPHCC).</p> <p>The foundation stone of the building was laid in 2013 and the construction was completed in 2016.</p> <p>The building was constructed as per requirements of the institution. It was mentioned that the institution was earlier housed in a building constructed by NIRMITI Kendra in 2000 which was certified as unfit by the same agency in 2010, following which the current asset was created.</p> <p>The building has 27 rooms which caters to all the needs of the children such as dormitories, study room, recreation and sports facilities, library, dining room etc.</p> <p>A proposal for construction of a gym for the use of the children was made and is awaiting approval.</p> <p>The institution currently houses 35 children and can cater to the needs of up to 50 children. Even though there were enough rooms available, the children were accommodated in dormitories for ease of monitoring.</p> <p>The location of the Children's home is apt as there was ample space for the children to play and it was located in close vicinity to schools and hospital.</p>
3	<p>Design Stage</p> <p>The design of the building was done in accordance with the norms of the Social Justice department.</p>
4	<p>Maintenance</p> <p>The routine maintenance is carried out by means of planned funds allotted each year. This fund is utilized to cater to needs such as food, medicine, clothing etc., for the children and also for maintenance activities.</p> <p>Routine visits are carried out by the District Sessions Judge as per directions of the High Court. Most maintenance activities are hence carried out in a periodic manner according to the directions given by the Judge.</p>

Discussion Points	
	<p>The amount sanctioned every year depends on the number of children present. Allocation for financial year 2019-20 was INR 9,20,000.</p> <p>The superintendent mentioned that more funds are allocated if the initial allocation is found insufficient.</p> <p>Civil maintenance activities are carried out by KPHCC and electrical works by PWD.</p> <p>The Study team observed that the bathrooms visited were broken and damaged.</p> <p>It was also observed that the kitchen was clean and well maintained.</p> <p>The premises uses a septage system for liquid waste management and the solid wastes are burned.</p>
5	<p>Others</p> <p>Majority of the fund allocation to the institution takes place under the Integrated Child Protection Scheme.</p> <p>One of the major issues faced by institution is the lack of a vehicle. Currently private vehicles are being hired to transport the children to schools.</p> <p>An amount of INR 15,000 was available for urgent requirements such as taking children to the hospital etc.</p> <p>The monitoring of activities of all such institutions in the district (27 in number) are done by the District Child Protection Committee headed by President of the Zilla Panchayat (Chairperson) and the District Collector (Vice Chairperson) and the Juvenile Justice Committee headed by the District Sessions Judge.</p> <p>The committees discuss matters such as abuse towards children, POSCO Act related issues, education of children etc.</p> <p>The meetings are conducted on a quarterly basis.</p> <p>The children from the institution have won multiple prizes in sports and other competitions in the district and state level, the trophies of which were displayed in the office room.</p> <p>The Superintendent mentioned that there were no monthly or periodic meetings with the Secretary or the District Collector to discuss the various administrative and operational matters about the institution.</p> <p>The sanctioned posts in the institution include:</p> <ul style="list-style-type: none"> 1 Superintendent 3 Caretakers 1 Cook 1 Sweeper 1 Counsellor (contract employee) <p>The funds are provided by the state and central governments in the ratio 40 : 60.</p> <p>An individual care plan is prepared for each child at the time of their entry into the premises.</p>

p. Meeting with the Deputy Tehsildar, Taluk Office, Mananthavady

Meeting Information	
Meeting Name/Topic	Meeting with the Deputy Tehsildar, Taluk Office, Mananthavady
Date/Time	12 December 2019, 11:00 AM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Prassanna Kumar, Deputy Tehsildar, Taluk Office, Mananthavady
2	Mr. Sineesh Joseph, Clerk, Taluk Office, Mananthavady
3	Mr. Dhruv Goyal, Centre for Management Development.
4	Ms. Abhilasha Jain, Centre for Management Development
5	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Deputy Registrar on the objectives and scope of the study. The main points of discussion are detailed below:
2	<p>Planning and Construction Stage</p> <p>Total area of premises: 1 Acre</p> <p>The building was constructed in the pre-Independence period as a prison and was converted post-Independence to the Taluk Office premises.</p> <p>It was mentioned that an additional wing was constructed in the year 2000.</p> <p>Since the construction of the new block was completed in 2000, no details were available with respect to planning, design, construction or quality control of the asset. The focus therefore was primarily on maintenance.</p>
3	<p>Maintenance</p> <p>The official provided a brief outline of the processes undertaken for maintenance activities:</p> <p>Proposal send from Taluk office- 1 month (approximate time)</p> <p>Processing at Collectorate- 1 month</p> <p>Proposal send to Land Revenue Commissioner for approval- 6 months to 1 year</p> <p>Administrative Sanction and Funding- 1.5 to 2 years</p> <p>Proposal returned to Collector</p> <p>Proposal send to Implementing Agency for Technical Sanction, tendering etc.</p> <p>Issue of Contract</p>

Public Infrastructure

Development & Management

	Discussion Points
	<p>If the funds were readily available with the District Collector, the maintenance activities will take place at a faster pace.</p> <p>This can be seen in a recent example where 45 computers were procured in a period of 4 months between July 2019 and November 2019 as funds were readily available with the Collector under the Digital Governance scheme.</p> <p>A permanent account amount of only INR 5000 was available for routine maintenance activities. It was mentioned that the amount is insufficient to meet the routine expenses in the office.</p> <p>In cases where repairs were required in IT and computer related activities for even menial matters professionals had to be hired in accordance with the asset maintenance contract (AMC).</p> <p>The official mentioned that by providing basic training to a minimum number of staff members could save time and effort. This was because a delay of 2-3 days was caused even for very small issues.</p> <p>Separate security services are not provided and that office assistants also performed the role of security personnel – a point noticed consistently across assets visited.</p> <p>The building used a septage system and the solid wastes were usually burned.</p>
4	<p>Others</p> <p>The daily footfall was on an average 300 people/ day. The purpose of visit varies from issue of certificates such as income certificate, nativity certificate and financial assistance as part of flood relief.</p> <p>All revenue offices in the district are currently working under e-Office. This was done in 3-4 months as funds were available under the scheme for digitization of land records. This was done due to the efforts of a pro-active Collector showing how processes and changes depends on individual initiative.</p> <p>Apart from 500-600 older files 75% of the records are now being digitally maintained under e-Office platform.</p> <p>There was no centralised repository for all records coming under a particular taluk as records pertaining to village offices were maintained there.</p> <p>The that fire and rescue systems were in place and are checked on a yearly basis.</p> <p>The total sanctioned manpower of the office is 88:</p> <ul style="list-style-type: none"> 2 Tehsildars 8 Deputy Tehsildars 63 Clerical Staff 13 Office Assistants 1 Driver 1 Sweeper <p>Due to increased ambiguity and multiplicity of government orders released from time to time, junior officers avoided taking initiative and responsibility slowing down the decision making process.</p> <p>Comprehensive government orders can improve the speed of decision making in government offices.</p>

q. Meeting with the Joint Director, Department of Tourism, Calicut

Meeting Information	
Meeting Name/Topic	Meeting with the Joint Director, Department of Tourism, Calicut
Date/Time	13 December 2019, 9:30 AM

Meeting Attendees	
Sl. No.	Attendees
1	Ms. Anitha Kumari C. M., Joint Director, Department of Tourism, Calicut
2	Mr. Lineesh Thomas, Project Engineer, District Office, Tourism Department, Wayanad
3	Mr. Salim, Tourism Information Officer
4	Mr. Yusuf P.M., Senior Project Engineer, KITCO
5	Mr. Aneesh Prakash, Project Engineer, KITCO
6	Mr. Rabeenson Thomas, Project Engineer, KITCO
7	Ms. Lekshmi J.H, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Joint Director and the Project Engineers on the objectives and scope of the study. The main points of discussion are detailed below:
2	<p>Planning and Construction Stage</p> <p>Total area of the premises: 5 Acres</p> <p>Total constructed area:</p> <p>New Building: 5,83,051 sq. m.</p> <p>Year of construction/ Constructing Agency:</p> <p>New Building: Phase 1: 2011-2014, Phase 2: 2012- 2014, Phase 3: 2016 – present / KITCO</p> <p>Old Building: 1964/ PWD</p> <p>Phase One:</p> <p>28/May/2010 – Administrative Sanction (AS) Received.</p> <p>25/April/2011 – Start of Construction</p> <p>15/Oct/2014 – End of Construction</p> <p>Total period required for construction as per Detailed Project Report (DPR) : 10 months</p> <p>Fund allocated as per DPR: INR 2.2 Crore</p>

Discussion Points	
	<p>Time overrun: 32 months</p> <p>Cost overrun: INR 62,992</p> <p>The reason for the time and cost overruns in phase 1 was the lack of initially sanctioned funds availability.</p> <p>Phase Two</p> <p>6/March/2012 – AS Received</p> <p>18/Aug/2012 - Start of Construction</p> <p>15/March/2014 – End of Construction</p> <p>Total period required for construction as per DPR: 12 months</p> <p>Fund allocated as per DPR: INR 2.99 Crore</p> <p>Total extension in duration provided: 4 months</p> <p>Time overrun: 3 months</p> <p>It was mentioned that the final cost of construction in phase two was INR 2.93 Crore. Thus there was no cost overrun.</p> <p>Phase Three</p> <p>23/April/2014 – Estimate submitted to Chief Technical Examiner (CTE) for review (Estimate amount: INR 11.25 Crore).</p> <p>3/July/2014 – AS awarded subject to scrutiny by CTE.</p> <p>1/Aug/2015 – Revised estimate requested by CTE taking into account previous comments by him.</p> <p>4/Sep/2015 – CTE’s proposal forwarded to KITCO.</p> <p>19/Oct/2015 – Revised estimate submitted to department as per directions of CTE (Estimate Amount: INR 15.97 Crore).</p> <p>27/April/2016 – Start of construction (On-going as per initial estimate).</p> <p>The revised estimate is still under review of the CTE and this has adversely affected the pace of construction as the funds are not being released. Currently the construction is being done under the initially sanctioned estimate.</p> <p>Majority of the civil and electrical works in the building including fixture of equipment such as air conditioners and plumbing has been completed.</p> <p>The rooms could not be let out at this point of time as furnishing, elevators and certain fire and safety measure that are still to be completed are included in the portion of the estimate are still pending approval of the CTE.</p> <p>These delays have significantly affected KITCO, the implementing agency as the equipment such as ACs were fixed more than 18 months ago. As this exceeds the guarantee period of the devices and the ownership remains with the implementing agency, this is causing them considerable losses.</p> <p>The Joint Director mentioned that while PWD takes payment upfront, agencies like KITCO construction is carried out on a contract basis with payment on completion of various milestones. Thus most departments currently prefer agencies such as KITCO than PWD.</p>

Discussion Points	
3	<p>Design Stage</p> <p>In the department of Tourism, the design is being created by an architect employed by the department according to needs of the major stakeholder which is the department in itself.</p>
4	<p>Maintenance</p> <p>The routine maintenance activities such as sanitation, plumbing, electrical works, IT services etc. are carried out by in-house staff.</p> <p>Other major maintenance activities such as civil and plumbing works are carried out by the agency that constructed the asset. In this case it will be the PWD or KITCO for the old and new buildings respectively.</p> <p>It was mentioned that though the old and currently functional building houses 8 suites, 3 of them cannot be rented out due to leakage issues during rainy season.</p> <p>It was mentioned that even though a proposal was submitted for repair works, the estimate prepared by PWD was insufficient to completely address the issues and is hence being reworked with NIRMITI.</p> <p>It was mentioned that the current sanctioned posts in the guest house will be insufficient once the construction of the new building is completed as it houses 52 rooms.</p>
5	<p>Others</p> <p>The following is the devolution of powers for the various officials in the department of tourism regarding administrative sanctions.</p> <p>Deputy Director: up to INR 10,000</p> <p>Joint Director: up to INR 2,00,000</p> <p>Director: up to INR 1 Crore</p> <p>State working group, Department of Tourism: up to INR 10 Crore</p> <p>Special working group, Ministry of Finance: greater than INR 10 Crore</p> <p>It was mentioned that the agencies such as KITCO and NIRMITI Kendra undertake projects without transfer of estimate amount unlike PWD which required the estimate amount to be transferred before site handover.</p> <p>It was mentioned that in either case the major problem which leads to delays in asset construction as well as maintenance is fund shortage.</p>

r. Meeting with the Managing Director and Chief Engineer, KPHCC

Meeting Information	
Meeting Name/Topic	Meeting with the Managing Director and Chief Engineer, KPHCC
Date/Time	6 January 2020, 3:00 PM

Meeting Attendees	
Sl. No.	Attendees
1	Mr. Shyam Sundar, Managing Director, KPHCC
2	Ms. Jose H Johnson, Chief Engineer, KPHCC
3	Mr. Dhruv Goyal, Centre for Management Development
4	Ms. Sanjana Pothan, Centre for Management Development
5	Mr. Ashil Varghese, Centre for Management Development
6	Mr. RituparManivanan, Centre for Management Development

Discussion Points	
Sl. No.	Discussion Points
1	The meeting commenced with a brief introduction being given to the Managing Director and Chief Engineer on the objectives and scope of the study.
2	<p>Overview</p> <p>The Kerala Police Housing Construction Corporation Ltd(KPHCC) undertakes construction work of not only police stations but also university buildings, forest department etc.</p> <p>For construction of police stations, the request comes from the Police Headquarters, where the DPC compiles all the demands from different stations. Once request is received, officials from KPHCC undertake estimate preparation followed by preparation of structural design, soil testing and so on.</p> <p>Activities such as soil testing and structural designs are prepared by outside agencies and estimates are prepared on PRICE software. Structural designs are prepared by the P.Es and other engineers on the basis of requirements given by the police headquarters and after consulting the DPO and engineers in the police department.</p> <p>Once the estimates are prepared, the estimates are sent to the corresponding headquarters (PHQ in case of police stations).</p> <p>Once approved by the head department, KPHCC accords Technical Sanction (TS) upto an amount of INR 5 crores. An amount above 5 crores has to be approved by a technical team.</p> <p>This is followed by an e-tendering process and the contract is signed through KPHCC. Any delay in completion attracts penalty.</p>
3	<p>Quality Control</p> <p>For every project worth INR 50 lakhs and above, an in house QC team needs to be set up as per the PWD manual.</p> <p>There is also a vigilance organization (consisting of two policemen for each district) to check the quality reports on a daily basis.</p>

Discussion Points	
	<p>The bills are processed only if quality papers are submitted and checked.</p> <p>Though there is no factory inspection of manufacturers, only specified brands are used to ensure quality.</p> <p>Site inspections are also undertaken. Any deviation from quality standards will attract penalties.</p>
4	<p>Monitoring of construction</p> <p>This is done through monthly meeting of all Project Engineers.</p> <p>There is also a Project Management Google Sheet for getting daily updates of work undertaken.</p>
5	<p>Maintenance</p> <p>The MD and the CE emphasised that there is no fund allocated for maintenance. Once the defect liability period of 5 years gets over, the contractor can no longer be held responsible for maintenance and funds from the government are required which is largely missing now.</p> <p>Moreover, it was also mentioned that routine maintenance activities such as waste disposal etc are not undertaken by KPHCC.</p>
6	<p>Planning</p> <p>Standard drawing/ designs of different categories of Police Stations have been approved by the DG and these are followed in construction. KPHCC cannot deviate from these plans and merely executes them.</p> <p>The MD emphasised that most plans are linked to the budget available.</p>
7	<p>Staff</p> <p>Every district has 1 Project Engineer (P.E), 2-3 Assistant P.E and site supervisors. The Project Engineers are civil engineers while the site supervisors are recruited from ITIs.</p> <p>All technical staff are on contract basis and not government staff.</p>
8	<p>Others</p> <p>Some best in class police stations mentioned were Aruvikkara, Vilapilsala and Neyattinkara stations which have been constructed as per most recent standards.</p>

Annexure 4: Illustrative Proposed Templates

Indicative template for monitoring of Civil Works in a Power Sub-Station

Fortnightly Review Template EPC Works
Annexure A : Civil Works Status (As on <Date>)

Name of Scheme:		LOA Ref. & Agency:		Zone:	
Date of Starting (Zero Date)		Scheduled Completion as per Zero Date		Division:	

Sl. No.	Description	Unit	Total Qty. (LOA)	Total Revised Qty.	Progress upto previous fortnight		Progress during current fortnight		Total Progress as on <Date>		Remarks
					Sch	Act	Sch	Act	Sch	Act	
	CIVIL WORKS										
1	Gantry Foundations										
2	Equipment Foundations										
2.1	CT										
2.2	PT										
2.3	CB										
2.4	Isolator										
2.5	Lightning Arrestor										
2.6	Wave Trap										
2.7	Coupling Capacitor										
2.8	Transformer										
3	Cable Trenches										
4	Control Room										
4.1	Control Room Plinth Level										
4.2	Control Room Lintel										
4.3	Control Room Slab										
4.4	Control Room Finishing & Completion										
5	Metal Spreading										

Entered By:

Dy EE/AE - Civil Sub Division

Date:

Approved By:

EE - Civil Division

Date:

Nodal Officer:

EE - Construction Division

Date:

Attested By:

Contractor Site In Charge

Date:

Indicative template for fortnightly review meeting – Contractor’s manpower at site

Fortnightly Review Template EPC Works Contractor Structure Review (As on) (As per Clause 5.14.10 of Implementation Agreement)					
Name of Scheme	220KV Krushnoor s/S	LOA Ref & Agency	Zone		
Date of Starting (Zero Date)		Scheduled Completion as per Zero Date		District	

S.N.	Contractor Personnel at Site	Name	Number of Man-days Spent in Site in the Fortnight	Remarks
1	Site In Charge			
2	Civil In Charge			
3	Electrical In Charge			
4	Commercial In Charge			

Any other site remarks

Entered By _____
 By EE / AE - Construction Sub-
 Date: _____

Nodal Officer _____
 EE - Construction Division
 Date: _____

Attested By _____
 Contractor Site In Charge
 Date: _____

Indicative process flow for fortnightly review meeting – Contractor’s Review

This meeting shall be called by the EE (**Construction Division**) review. The EE (Construction Division) is the nominated Project Manager for all construction activities in the Division.

Date of Meeting:

- 1st Fortnightly Meeting between 9th and 11th of the Month
- 2nd Fortnightly Meeting between 24th and 26th of the Month

This meeting is to be conducted in the Office of EE (Construction Division) as it provides an opportunity for the SE (Construction) to physically visit Division Offices and to also inspect sites. Alternatively, this meeting can be conducted in the Office of SE (Construction Circle).

Objective of the Meeting:

To review physical progress of the project, status of bills / payments, coordination and support between <Govt. Department> field personnel and <Contractor>; resolve any disputes/ issues or gaps in information or agreement on project progress needs to be resolved during this meeting.

Meeting Attendees (Required to attend):

- SE – Construction Circle
- EE – Construction Division (leads the meeting)

- Dy EE – Construction Subdivisions
- Mgr F&A – Construction Division (or the current In charge of the same)
- Site In – charges of contractors for each Work Order in the Division (i.e. Each Work Order to be presented by a dedicated Site – In charge).

Reporting:

- The EE (Construction Division) is responsible for ensuring that the **Fortnightly Review Report** (which is a compilation of annexures as shown above) is filled up to date. The Fortnightly Review Reports should be prepared for each Work Order for which Zero Date has been fixed separately.
- The Fortnightly Review Report for each Work Order shall be reconciled and finalized during this meeting and mutually agreed between<Govt. department> Field Personnel and Site In - charge of<Contractor>.
- The finalized Fortnightly Review Report is to be signed by the concerned personnel of <Govt. Department and Contractor>as given in the templates.
- A soft copy of all Fortnightly Review Reports for Work Orders in the Division needs to be emailed by the EE (Construction Division) to <Email Id> with a copies (CC) to the <Contractor's Site In Charge>, SE (Construction Circle), on or before 13th of the Month following the 1st Fortnightly Meeting and on or before 28th of the Month following the 2nd Fortnightly Meeting.
- The hard copy with signatures/approvals of concerned personnel needs to be sent to the SE (Construction Circle). The SE (Construction Circle) shall bring the Fortnightly Review Reports to the Corporate Office for the Monthly Review Meeting scheduled for the 18th/19th of each month.

Annexure 5

Design Standards and Recommendations for Roads

1 Geometrical Design guidelines for roads

The geometrical design standards for rural highways are designed according to IRC 73-1980. The road designs are basically carried out on the basis of categorized scenario; National Highways, State Highways, Major District Roads, Other District Roads and Village Roads. Along with this, it is necessary to consider the design traffic, design speed, stopping sight distance, terrain of land and cross-sectional conditions.

Width of the carriageway

In designing the width of roadway, conditions like single lane/ double lane, plane-rolling type terrains are considered. It varies for different categories of roads. It is recommended to accommodate various other factors like roadway width at cross drainage structures like culverts, bridges etc. The other engineering design parameters include designing shoulder width, median width, drainage width, utility space, clear zone etc.

Horizontal and Vertical alignment of roads

It is advised to provide sufficient super elevation in the horizontal curves as per calculations based on the speed and radius of the curve. A proper set back distance should be given for better lateral visibility in the curve. In the case of smooth entry of vehicle from straight to circular curves, provide a transition curve of required length of transition.

Sharp curves should be avoided as possible. Provision of Rumble strips and speed calming measures should be provided in such areas to avoid conflicts. If necessary, to provide sharp horizontal curves, carriageway is to be widened to provide safe passage of vehicles. Further design criteria and precaution should be considered in the case of hair pin bends. In hilly areas, gradient should be eased by considering the grade compensation at curves.

The vertical alignment should provide for a smooth longitudinal profile consistent with category of the road and lay of the terrain, Grade changes should not be too frequent as to

cause kinks and visual discontinuities in the profile. Desirably, there should be no change in grade within a distance of 150 m. This is carried out by considering the terrain of road. Design criteria and calculation are considered according to whether the curve is a summit curve or a valley curve. The horizontal and vertical alignments should be properly coordinated.

The alignment of curves should not be compromised for other constructions and buildings like houses on curves. It should be aligned giving prior importance to safety.

Vattappara, a major accident spot along NH 66 located 26 km from Valanchery in Malappuram district was a typical example of deficiencies in geometric design standards resulting in major accidents. Most of the crashes occurred due to over speeding while maneuvering the sharp curve which is in a downward gradient and resulted in overturning of vehicles into the valley side of the curve. This indicates a possible deficiency in the horizontal geometric provided at the curve. The geometry of the curve was not adequate to ensure a smooth maneuvering of the traffic flow.

As part of the improvement proposal, the all curves in the 0.5 km radius are proposed for improvement to meet the design standards. The design speed adopted along the project road varies from 40kmph at the normal stretch to 20kmph at the critical curve location. Vertical geometry was improved to a design speed of 40kmph throughout the road stretch. In order avoid the reconstruction of pavement, vertical geometry is kept in line with the existing profile to the maximum extent possible. All vertical curves shall comply with the criteria of stopping sight distance. The curve radius at the accident spot location is increased to provide a smooth manoeuvring flow of traffic along the curve. Also, two curves before and after the critical curves are introduced for reducing the speed at critical curve. The existing two lane road at the curve is improved to intermediate/2 lane movement separated by a New Jersey type barrier. This will guide the vehicle drivers to follow the lane discipline which in turn avoid the possibility of head-on collision. Transition curves as well as the super elevation at the curve location are duly considered as part of the improvement proposal. The proposal measures complying to the standards suggested by IRC codes was partially implemented and showed a substantial decrease in accidents.

The suggestions resulted from a scientific study are still implemented partially. The road construction should be complied with the relevant IRC standards.

2 Side Drains

Side drainage should be designed according to IRC SP 42-2014. The proper functioning of pavement depends on a well-maintained drainage system. One of the reasons for frequent damage of bituminous pavements are lack of proper drainage facility.

The provision and maintenance of drainage on both sides of roads are important while considering the life of the pavement.

3 Road markings

The road infrastructure includes signals, sign boards, road markings and several other facilities. According to IRC 35-2015, the specifications for road markings of various utilities are suggested on technical basis. The excerpts can be written as follows;

Longitudinal markings

There are white longitudinal markings as indicators to the driver. Yellow markings are provided for obstruction approach, no overtaking zone and continuous centre lines. Broken lines can be crossed with discretion, if traffic permits. In the case of solid and double solid lines, both indicate restrictions in which solid lines indicate that crossing is not permitted except for entry -exit and side roads. Double lines indicate maximum restrictions. Centre lines are provided to separate opposite streams of traffic.

Traffic lane lines are of 100 mm wide broken lines. It differs in various conditions for 2/3 lane roads to four and other multilane roads. The barrier line distances in the case of no overtaking zones are designed on the basis of intermediate sight distance and 85th percentile speed. There are continuous guiding edge lines to provide comfort to the driver especially during night. These 150mm single continuous white line provided on road having more than 2 lanes are reflectorised in most of the cases. The bus lane markings should be provided in each case according to the requirements.

Markings at Intersections

Various markings at Intersections are provided for the easy movement of vehicles. Markings should be provided for stop line, give way line, pedestrian crossing, cyclist crossing, speed change lane, direction arrows, right turns, rotary and continuity lines. The continuity lines are usually provided at 100 mm width, 600 mm length and at 300 mm gaps in white colour.

Pedestrian crossing lines are provided at important intersections according to IRC 103-1988. The width of the pedestrian crossing is governed by the pedestrian volumes across the road and by local requirements. Width of the footpath should be a minimum of 1.5metrers, but it may be compromised for our limited space availability in various cases.

Markings at Hazardous locations

These are necessary mainly in many of our accident-prone zones. Line markings at carriageway width transition shall be 100 mm wide and of standard centre line or lane line design. Median width transition marking and obstruction approach marking should be provided compulsory.

Word messages: All the required word messages should be given to guide, warn and regulate traffic. The legends like STOP, SLOW, BUS LANE, KEEP LEFT, SCHOOL, RIGHT TURN etc should be placed according to the requirement. Theses should support with the standard signs.

Object markings: These are obstruction markings which are used to denoteunderpass, piers and abutments, monuments etc. objects within the carriageway should be marked by not less than 5 alternative black and yellow lines at 45-degree inclinations towards obstruction.

The road markings are not properly done at many roads in the state. Markings has a major role of guiding the road users to use the roads in a safer way. Absence of markings or improper markings may lead to increasing the number of crashes in the roads. Hence there is a robust implementation of markings are required in our roads and no reasons are valid for not giving proper markings in the roads while considering the number of lives lost in the roads.

4 Speed breakers

The roads are designed for a certain design speed to meet the mobility requirement. At some of the locations control of speed may become necessary. To ensure that the posted speeds are maintained, it is practice to provide certain control measures known as traffic calming measures. These measures can ensure improved traffic movement with better safety and convenience.

The design guidelines for speed breakers are to be carried out according to IRC -99 2018. They should be installed to provide visual, audible, and tactile stimuli which can alert driver to slow down. They are of different dimensions and are chosen according to the type of traffic.

5 Signs and signals

Traffic signs and signals provide valuable information to drivers and other road users. They represent rules that are in place to keep you safe, and help to communicate messages to drivers and pedestrians that can maintain order and regulations and reduce accidents. Neglecting them may end up with crashes.

The design guidelines for road signs are based on IRC 67 2012. These are incorporated in Motor vehicle act. The signs, placed on left hand side of road usually are implemented according to the requirements. On kerbed roads, the bottom edge of the lowest sign shall not be less than 2.1 m and not more than 2.5 m above the kerb. On roads without kerb, the bottom edge of the lowest sign shall not be less than 2 m and not more than 2.5 m above the crown of the pavement. They should be of standard size and colour according to the specifications.

The Oachira- Parippally Road stretch of National Highway 66 used to be a highly accident-prone stretch. From the investigation it was found that over speeding and rash driving of the vehicles were identified as the major cause of fatal accidents on the study stretch. In addition, it was found that absence of poor retro-reflective signs, less visible markings, lack of retro-reflective studs, absence of street lighting, unscientific design of segregated bus stops etc also causes accidents. Road markings and signages provided do not comply with relevant Indian Roads Congress (IRC) standards. Edge line marking and centre line marking was not visible. Traffic signages was installed years before had lost its retro reflective property. All of the above reasons clearly understate the fact that when road signs, markings and signals when not comply with the relevant standards and specifications can significantly increases road accidents.

Hence it is suggested that the proper signals and signs at par with the IRC standards and MoRTH specification are to be installed in the roads and disregard to this by without providing may be treated as an offence.

6 Materials and Methods of work

The materials and methods for construction of roads vary according to the type of road, whether it is bituminous, gravel road or concrete type. Aggregate and bitumen property tests should be carried out to ensure quality of materials. Particle size distribution, CBR test are some among these.

The material property will highly affect life of the road assets. Therefore, the quality as per MoRTH specifications should be adhered while constructing the roads assets. Also, the suitability of materials for construction of roadways may be analysed/examines critically by case wise as the material quality requirement are varying with the design factors/parameters.

7 Maintenance and quality control

Proper annual and periodic maintenance should be done to sustain the life of pavement. Otherwise, repeated damage to same locations in roads will occur frequently. The pavement can withstand varying climates only if there is proper maintenance.

The guidelines for quality testing should carry out based on IRC 57- 2000. The testing materials and methods are according to this IRC Code. The quality audits, training, servicing and safety analysis are to be done in each and every aspect of work.

Quality checking should be practiced as an essential thing and the bills should be linked to the results of quality check.

8 Importance of traffic studies and Axle load

Traffic studies should be conducted to arrive at design traffic volume with most accuracy. It should not be underestimated as the pavement will be designed for a lower traffic volume. This will affect the entire traffic and pavement conditions throughout the period badly. In Kerala, it is been observed that the trucks are loaded heavily which in turn has an axle load which is very higher than the design figures. These heavily loaded axles damage the pavement more intensively and reduce the life of the pavement. *There should be strict provisions to follow the limiting values.*

9. Design of bus bays and Bus stops

Design of bus bays should be done compulsorily, because in most of the cases its

importance is neglected but it can reduce the congestion and conflicts up to a great extent. Bus stops in general, should not be provided at curves. Bus stop designs are carrying out under IRC 70 2017. Another reference for guidelines is KMBR- Kerala Municipality Building Rules for design of bus shelters and waiting stations/ bus stops.

10. Parking provisions and Importance of infrastructure

The parking provisions should be followed to avoid unnecessary congestions. The parking regulations and guidelines should be followed according to parking management policies under each district planning authority. For each city, the provisions will change as per the availability of space and properties of traffic. The newly built shopping centres in congested areas should possess sufficient parking space

Infrastructure management should be followed strictly to provide an anti-social environment in roads and bus stations. Street lights and signal lights should be functioned properly, frequent checking is needed. The lux of light in junctions should be based on the direction of traffic and comfort of driver.

11. The management of activities of different departments in road

The activities of various departments in roads should be well coordinated and monitored by a common body so that organization of work can cause less and inappropriate damage to roads. In the case of road digging related works, the removal of each road layer was seemed to be replaced not in the order. It can cause sudden and severe damage to same locations repeatedly. So, a proper management is compulsory.

Typical example

Adoor – Kazhakkootam road stretch, is a part of State Highway-1, popularly known as MC road(Main Central Road). The stretch is of length 80 km and passes through three districts, Thiruvananthapuram, Kollam and Pathanamthitta, which has been developed under Kerala State Transport Project. It is in rolling terrain characterized with sharp bends/curves and inhabitation along either side. It carries heavy volume of traffic during the day and night, increasing tendency of overspeeding and high road fatalities during the last few years. A number of intersections are located along the road. Ribbon development being the hallmark of the entire stretch, there are intense developments of all kinds and human activities along the road stretch resulting in unsafe situation.

The Adoor – Kazhakkootam road stretch is a typical example for a design compromises being made and how the design compromises can result in accidents. The road stretch, part of State Highway-1 bear the significant regional traffic movements characterized with sharp horizontal curves, vertical curves, lack of sight distance and number of access roads close to vulnerable locations. The road stretch is designed for a speed of 65 kmph. The vertical geometry at many portions of the road stretch does not comply with the design speed of 65 kmph. Also, at many portions the vertical geometry does not comply with the criteria of stopping sight distance. Sharp horizontal curves without adequate radius of curvature and transition length make the corridor unsafe for drivers. Absence of requisite retro-reflective signs, less visible markings, lack of retro-reflective studs, absence of street lighting, significant shoulder drop, unscientific design of intersections and bus stops etc. add to the woes. Based on the crash data analysis, a total of 85 accident black spots have been identified in the 80 km road stretch which is a testimonial to the fact that inadequate road design is a major factor for road accidents in addition to undisciplined behaviour of drivers.

2. INTERSECTIONS

Standards and recommendations for junctions

Intersections are an important and critical element of road section. The importance of intersection or junction design is that the efficiency, safety, speed, operational cost and capacity are directly related to junction design. The main objective of junction design is to ensure safety, convenience and comfort of road users while minimizing potential conflicts between vehicles and pedestrians. Based on traffic conditions intersections can be classified in three types. These are:

- **Uncontrolled Intersections at-grade:** These are the intersections between any two roads with relatively lower volume of traffic and traffic of neither road has precedence over the other.
- **Intersection with Priority Control:** There is theoretically no delay occurring on the major road and vehicles on the minor road are controlled by “GIVE – WAY” or “STOP” sign.
- **Time separated intersection/Signalised Intersections at-Grade:** A signalised intersection besides other warrants laid down by IRC:93-1985, is justified if the major

street has a traffic volume of 650 to 800 vehicles per hour (both directions) and minor street has 200 to 250 vehicles per hour in one direction only.

- Space Separated Intersection/Grade Separated Intersections: According to IRC: 92 - 1985, a grade-separated intersections, besides other warrants, is justified when the total traffic of all the arms of the intersection is in excess of 10,000 PCU's per hour.

Basic design principles are;

The design of an intersection must ensure safe, smooth and efficient flow of traffic. The following design principles is followed to achieve this,

1. Uniformity and Simplicity in design

The intersections must be designed for uniformity and simplicity. The design must keep the capabilities and limitation of drivers, pedestrians and vehicles using intersection. It should be based on knowledge of what a driver will do rather than what he should do. All the road signs and markings should be pre planned and decided prior to the start of construction work. This is a principle mostly violated at intersections in Kerala. In Kerala some of the road signs and markings are added on a later stage resulting in unawareness of road users about road signs and markings. Lack of awareness about signs and markings can create confusion among road users which leads to traffic accidents especially at intersections where complex traffic manoeuvres are employed. Undesirable short cuts like U turn manoeuvres should be avoided at intersections but because of the lack of strict enforcement or U turn arresters, this is not strictly followed in Kerala resulting in conflicts, delays and accidents.

In addition, IRC 41-1994, Guidelines for The Design of At-Grade Intersections in Rural & Urban Areas, suggests that on an average trip route, all the intersections should have uniform design standards so that even a newcomer to the area anticipates what to expect at an intersection. This includes uniform design speed, intersection curves, vehicle turning paths, super elevations, level shoulder width, speed change lane lengths, channelisation, types of curves and type of signs and markings. In Kerala mostly because of unplanned commercial spreading and vested political interests, many of these design elements are compromised. For instance, IRC-65 1976 code suggests various minimum radii for rotary islands depending on space availability, traffic and

various other factors. Compromising on the rotary dimensions to account more space for commercial activities result in inadequate turning paths for vehicle and it affects the smooth, safe and efficient flow of traffic at rotary intersections.

2. Minimization of Conflict Points

Any location having merging, diverging or crossing manoeuvres of two vehicles is a potential conflict point. These are undesirable for any intersection as they are responsible for the delay in traffic & the possible accidental potentials at a site. The prime objective of intersection design is to minimize the number and severity of conflicts between different vehicles and pedestrians and whenever possible, these should be separated. This can be done by:

- (i) Space separation: by access control islands through channelizing
- (ii) Time separation: by traffic signals on waiting lanes.

3. Safety factor in designing intersection

The safety of a particular design can best be assessed by studying the frequency with which types of accidents occur at particular type of intersection and its correlation with volume and type of traffic. It is, therefore, necessary that a systematic record be maintained of all accidents at intersections in Road Accidents Forms suggested in IRC: 53-2012. Some of the measures which could enhance safety at intersections are:

- (i) By eliminating highly trafficked side road connections, in rural sections upto 30 per cent reductions in accidents can be made.
- (ii) By converting lightly trafficked cross-road into properly designed staggered junction, 60 per cent reduction in accidents is possible.
- (iii) In urban areas, control of access, street parking and development in the vicinity of intersection improves the safety considerably.

Illegal parking, provision of bus stops in close proximity to junctions and commercial activities near to junctions are a major hindrance to the efficient working of intersections in Kerala. Alankode junction in Trivandrum district, a staggered intersection is a typical example of how unplanned space for commercial activities in the vicinity of intersection

and inappropriate signal design causes traffic delays and accidents. There should be proper planning to attribute the safety factor in the case of design of intersections.

Chamravattom Junction in Ponnanni Municipality, Malappuram district of Kerala is a five-arm intersection in Kanyakumari- Panvel National Highway (NH66, Old NH 17). NH 66 crosses Edappal- Ponnanni Road at this junction and Ponnanni -Tirur Road originates from this junction thus forming a five-arm intersection. Ponnanni –Tirur Road meets National Highway at acute angle making the junction a complex one in design. The accident rate observed at this junction is on alarming side. Widening of the NH66 which is a two-lane undivided road is to four lane divided road at the junction and providing a link road 150m from the junction for connecting Kozhikode arm and Tirur arm will improves the capacity and flow of traffic to a great extent.

Parameters of Intersection Design

Intersections are designed taking into consideration the flow, distribution and future growth of traffic. Separate designs have to be specified for each site considering physical conditions, land cost, construction cost and the effect of proposal on the neighbourhood. It is important that proper planning has to be made in advance with regards to space needed for traffic signs, traffic lights, drainage, public utilities etc. The important parameters of intersection design which affects the intersection capacity are;

1 Design Speed

Three types of design speeds are relevant for intersection element design:

- i. Open highway or “approach” speeds
- ii. Design speed for various intersection elements. This is generally 40 per cent of approach speed in built up areas and 60 per cent in open areas.
- iii. Transition speeds for design of speed change elements i.e. changing from entry/exit speed at the intersection to merging/diverging speed.

The “Approach” speeds relevant to various types of terrain and roads. In rural areas, ruling design speed should be used, but minimum can be adopted in sections where site conditions and costs dictate lower speeds. In the case of urban area, a lower or higher value of design speed can be adopted depending on the pressure of physical controls,

roadside developments and other related factors. A lower value is appropriate for central business areas and higher in sub-urban areas.

Majority of the junctions in Kerala are not designed and thus the approach speed is not maintained. Hence the rear end collisions and side impact collisions are higher in our junctions.

2 Design Traffic Volumes

Intersections are normally designed for peak hour traffic flows. Estimation of future traffic and its distribution at peak hours is done on the basis of past trends and by accounting for factors like new development of land, socio-economic changes etc. Where it is not possible to predict traffic for longer period, intersection should be designed for stage development for design periods in steps of 10 yrs. Where peak hour flows are not available, they may be assumed to be 8 to 10 per cent of the daily flow allocated in the ratio of 60: 40 directionally. For signalized intersections the signal timings are fixed on the basis of design traffic volume through each leg of intersection. The signal timings should be adjusted time to time on the basis of increase in traffic volume. This is not properly done in majority of intersections in Kerala which results in traffic congestion. It is recommended to correct the signal timings with respect to the traffic volume for each location.

3. Radius of Curvature at Intersection

The radii of intersection curves depend on the number and turning characteristics of the design vehicle, their entry and exit speeds at the intersection area. The design curve is developed by plotting the path of the design vehicles on the sharpest turn and fitting curves or combination of curves to the path of inner rear wheels. The first step in design consists of study of the projected traffic data, the number and frequency of the larger vehicles involved in turning movement and the effect of those large vehicles on other traffic. If very large vehicles are only occasional and they can turn with some encroachment on other traffic lanes and without disturbing traffic too much, it would be wasteful to design for the largest vehicle.

Selection of appropriate curve radii influences the vehicle speed at various points. The speed should be such that the vehicle should either be able to stop before the conflict point or accelerate to suitable speed to merge with traffic flow. The speed with which

drivers can follow a curve can be taken to be $6\sqrt{R}$ km/h for upto 55 km/h, where R is the radius of curve in meters.

The provision of turning radius in urban situations is a particularly problematic scenario since additional constraints like land cost, abutting developments, pedestrian crossings, restrictions on right of way and vehicular parking comes into picture. Generally, the minimum turning radius for a vehicle governs the design. IRC-SP 41-1994 recommends, ensuring efficient traffic operation on arterial streets a common radius of 4.5 m to 7.3 m for passenger cars and 9 m to 15 m for trucks and buses should be provided. The safety of pedestrians crossing the road is a matter of concern if the curve radii is to be increased since increasing curve radii will also increases the pedestrian crossing distance. Accidents involving pedestrians are commonplace in Kerala particularly at intersections owing to a number of reasons like;

- Complex signal phasing or lack of traffic control at high-volume, high-speed and multi-lane intersections.
- Limited or somewhat erratic compliance by motorists, even at intersections with priority control.
- Violation of traffic control by pedestrians at large urban intersections.
- Lack of enforcements for pedestrians and driver traffic control violations.
- Lack of pedestrian scale lighting at rural and suburban intersections which makes the pedestrian visibility to drivers worse particularly at night time.

Kunnamkulam Junction in Kunnamkulam, Thrissur district of Kerala is a five-arm intersection where the inadequacies in the junction design creates traffic congestion and frequent accident scenarios. Kunnamkulam junction is act as a time separated or signalised intersection. The entry/exit radius of the curves and the entry/exit angles was not adequate owing to the lack of proper width for the existing roadways at corner curves as per the standards thus making the junction unsafe for traffic operations. No channelizing islands to separate turn movements are provided at the intersection which should not be the case considering the higher volume of turning traffic. Also, the pedestrian movement at the junction is also higher. But no pedestrian markings are provided at the junction leading to frequent conflicts between pedestrians and motorists.

The improvement of this junction conforming with the standards only will help to reduce the existing problems in this junction.

4. Visibility at Intersections

The sight distance is one of the major factors in safety at intersections. The overall visibility at the intersections should be good so that the approaching driver is able to comprehend the junction well. IRC-SP 41- 1994 suggests that the driver must be able to observe and comprehend the speed and direction of approaching traffic from all other legs of the intersection. If a vehicle is approaching, he should be able to safely stop prior to reaching the intersection. The approaching driver must be able to see sufficient distance along the cross road so as to judge if he can cross by suitably adjusting the speed and direction. Special care to ensure visibility should be taken if intersection is located on high land in a cutting at or near a summit or near a bridge. Telephone poles, kiosks, signs, light posts etc. should not be placed where they restrict visibility. IRC: 66-1976 recommends a minimum visibility of 15 m along the minor road while for the major road, sight distance equal to 8 seconds travel at design speed is recommended for priority intersections.

All sight distance obstructions, like bushes, trees and hoardings in the visibility triangle at the intersections should be removed to improve safety. flex boards, billboards and advertisement boards which restrict sight distance as well as a major distraction for drivers at the intersections should be avoided. The level of brightness and illumination of roadside advertising has an important effect on driver behaviour. Some studies have reported that over-bright highway roadside advertising signs; a common sight in Kerala, can cause visual discomfort leading to accidents.

5. Use of traffic control devices at intersections

In intersection design, the possible use of traffic control devices and other road furniture should be considered. The common types of traffic control devices which are helpful in reducing accidents and improving flow conditions at intersections are road markings, road signs, signals, railing and flashing lights etc.

The maintenance of these road furniture are important and the lack of maintenance should be treated as a felony.

6. Road Markings at intersections

Carriageway markings within and in the neighbourhood of an intersection restrict vehicles from using areas other than those actually meant for them and thus ensure orderly movement of traffic. Depending on the actual intersection conditions, one or more of the followings carriageway markings should be provided at intersections.

- i. Centre line-solid or broken
- ii. Solid centre lines preceded by broken centre lines on approaches to important intersections as an additional aid to channelize traffic
- iii. Centre line along with barrier lines
- iv. Turn markings
- v. Directions markings
- vi. Lane markings

7. Signs and Signals at intersections

Traffic signs and signals are installed at junctions to properly guide and control the traffic approaching the junctions. Too many signs with inadequate spacing create confusion among drivers causing accidents. the signs should be properly spaced so as to be seen one at a time and thus conveying the message effectively. For night traffic visibility retro reflective signs must be used.

While posting the signs, adequate care should be taken so as to avoid the chance of their causing obstruction to pedestrian and vehicular traffic. In urban areas the lowest edge of any traffic sign should not be lower than 2.1m from the pavement when posted on foot paths/sidewalks. In rural areas the clear height of sign from the edge of the pavement should be 1.5 m. The nearest edge of the sign should be at least 1.2 m away from the edge of the carriageway on rural roads. When posted on raised foot-paths the same should be away by at least 30 cm from the edge of the kerb.

8. Reflectors

A large percentage of accidents at intersections occur at night due to poor visibility and hazards like traffic islands, median openings or other objects close to the carriageway. At

such locations, use of reflector units of suitable dimensions can improve safety considerably. A typical unit suitable for use on island consists of three circular reflective units mounted on triangular plate as per IRC: 79-1981. In urban or sub-urban areas, safety is best improved by illuminating the entire intersection area adequately.

3. Special considerations in urban areas

1. Spacing of Intersections

IRC SP41-1994 recommended minimum spacing between intersections along various types of roads is given below:

- i. Arterial highways/streets 500 metre
- ii. Sub-arterial streets 300 metre
- iii. Collector streets 150 metre
- iv. Local streets Free access

For junctions with linked traffic signals greater spacing between intersections may be provided.

Careful planning on linking of signals on arterial streets ensures continuous movement of traffic at a planned speed of travel. Such a coordinated signal system is mostly absent in the state of Kerala. Periodic changes in signal timings based on present traffic are not properly done in many signalized intersections in Kerala.

Limited number of access points with intervening streets may be provided for spacing closer than the above mentioned for different street types provided only left turns to and from the main street are permitted. Careful planning should be employed in the location and spacing of all major access points to bus terminals, railway stations, parking areas etc so as to ensure safety and freedom from congestion. One of the major reasons for traffic congestions at intersections particularly in Kerala is the provision of bus stops too close to intersections. It is desirable that bus bays are located 75m from the intersection on either side, preferably on farther side of the intersection.

On arterials, direct access to residential plots is not to be permitted. Driveways may, however, be permitted on a restricted basis for commercial and industrial complexes and

other public locations when these are major generators of traffic. Right turn from these driveways should not be permitted unless the crossing fulfills the spacing criteria for intersections given above. Moreover, adequate road geometries should be provided to enable safe operation of vehicles. On sub-arterials, direct access to residential property should be granted only where alternative access cannot be provided at a reasonable cost. Direct access to commercial and industrial properties may be allowed. On collector streets, access to abutting properties may be allowed to a limited extent keeping in view the safety of traffic. On local streets, which will have no/limited through traffic, access to abutting properties can be freely given.

All these standards are to be strictly followed for increasing the travel time in the Kerala roads and for ensuring the safety and comfort.

1. LIGHTING AND DRAINAGE OF INTERSECTION

Lighting at Intersections

Intersections, particularly the channelized ones need to be properly lighted to improve the safety and ease of traffic flow. Statistics shows that evening accident rate is higher compared to daytime accident rate, attributing to low visibility of drivers at night time. In urban and suburban areas where there are concentrations of pedestrians and roadside and intersectional interference, fixed source lighting tends to reduce accidents. There is a need to obtain reduction in speed of vehicles approaching the intersections. This should be clear, definite and visible to the drivers well ahead of the intersections that is beyond the range of headlights. Lighting of intersections with fixed source lighting accomplishes this. Luminaries that are not properly placed can cause glare discomfort for drivers leading to safety risks. To minimize the effect of glare and to provide the most economic lighting installation luminaries are mounted at heights of at least 9 m. Lighting uniformity is improved with higher mounting heights, and in most cases mounting heights of 10 m to 15 m are usually preferable. High mast lighting, special luminaries on masts of 80m or more in height, is used to light large highway areas such as inter-changes. This lighting furnishes a uniform light distribution over the whole area and may provide alignment guidance.

Drainage

Drainage facilities such as culverts, channels, kerbs, gutters and various types of drain should be provided to carry water across the right of way and for the removal of storm water from the road itself. The locations of such structures should be planned and designed to secure as low a degree of interruption due to flooding. While deciding upon the area required to acquire for intersections, drainage aspect and the possibility of future expansion has to be considered. Drainage facilities like channels, kerbs and gutters should be cleaned on a periodic basis such as to avoid clogging during intense rainy seasons. Proper connectivity of small drains of by roads with major drains has to be ensured to avoid flooding on by roads.

2. Right of way

The right of way of intersections depends upon the topography and overall standards of intersection development. While deciding the area of intersection the area to be acquired, the up gradation of the intersection to a future grade separated intersection based on future traffic projections should also be considered. The area shall be kept free from encroachments to facilitate future developments.

The Nizari junction at Ramanattukara is a typical example of inadequate area of the junction to carry traffic volume causing congestion and frequent accidents. The junction lacks proper merging and diverging lanes to separate the turning movement traffic. Considering the huge traffic volume handled by both the arms, the existing two-lane traffic movements at the junction location has to be widened to four lane divided traffic movement. Inorder to ensure the regulations proper islands are to be required to channelize the traffic movement in the junction. In addition, merging and diverging lanes are necessary so that the straight moving traffic is not affected by turning traffic.

3. Junction design compromises: An example of Adoor High School and bypass Junction

Adoor high school and bypass junction is situated at the intersection of NH 183 and Kayamkulam – Pathanapuram road. A comparison of both long term and short-term proposal clearly shows the compromises done in the design due to shortage of land. The long term and short-term proposals are shown below.

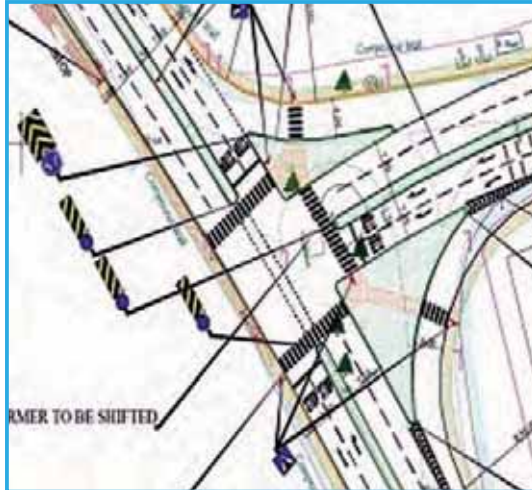


Fig 1: Long term proposal of Adoor high school and bypass junction



Fig 2: Short term proposal of Adoor high school and bypass junction

The long-term proposal suggests a right of way of 20.5 m with 3.75 m standard lane width, 1.5 m shoulder and 2 m footpath cum drain. But the short-term proposal which is going to be implemented has a lane width of only 3.5 m and shoulder width 1 m. In the long-term proposal, the zebra crossing for pedestrians is provided but this is absent in short term proposal. Also, there is no provision for drainage in the short-term proposal.

