

Business Process Re-engineering Report

Business Process Re-Engineering Report

**Municipal Finance and Management Component
Bhutan Second Urban Development Project (BUDP-2)**

Business Process Re-engineering Report

Disclaimer:

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As it is practically not possible to study all aspects of a process in its entirety thoroughly during the limited time period of an assessment, based on our methodology for conducting assessments, we conducted a review of the process and held discussions with the process owners and other key people in the process during the planning stage of assessment which helped us in identifying specific areas where architectural & process gaps may exist, opportunities for process and technology improvement. Our subsequent test work, study of issues in detail and developing action plans are directed towards the issues identified. Consequently, this report may not necessarily comment on all the function / process related matters perceived as important by the management.

The issues identified and proposed action plans in this report are based on our discussions with the people engaged in the process, review of relevant documents/records and our physical observation of the activities in the process. We made specific efforts to verify the accuracy and authenticity of the information gathered only in those cases where it was felt necessary. The work carried out and the analysis thereof is based on the interviews with the personnel and the records provided by them.

The identification of the issues in the report is mainly based on the review of records, sample verification of documents / transactions and physical observation of the events. As the basis of sample selection is purely judgmental in view of the time available, the outcome of the analysis may not be exhaustive and representing all possibilities, though we have taken reasonable care to cover the major eventualities.

Errors and Omissions:

When reading this document if you identify any errors or omissions please advise the author in writing, in 15 calendar days, giving a brief description of the problem, its location within the document and your contact details.

Confidentiality:

This document contains privileged and confidential information pertaining to “Strengthening municipal financial management”. The access level for the document is specified above. The addressee should honour this access rights by preventing intentional or accidental access outside the access scope.

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Executive Summary

Bhutan Urban Development Project (“BUDP”) II was initiated through the IDA credit of USD 12 million secured by Royal Government of Bhutan (“RGoB”) with the aim to:

- a. strengthening municipal management systems starting in Thimphu and Phuentsholing
- b. improving infrastructure services in northern Thimphu

BUDP II has the following components:

- a. Component #1: Municipal Finance and Management
- b. Component #2: Thimphu Northern Area Development
- c. Component #3: Capacity Building

This project (“Strengthening Municipal Financial Management”) is a key part of Component #1: Municipal Finance and Management. This component through this project aims to strengthen the institutional systems and financial processes of the two Thromdes (city governments) in Bhutan viz. Thimphu and Phuentsholing Thromdes as well as the Ministry of Finance (“MoF”) and the Ministry of Works and Human Settlement (“MoWHS”) to put in place sustainable policy and process framework for financing municipal services. The Policy and Planning Division (“PPD”) of the MoWHS is the implementing agency. It is expected that PPD, MoWHS will be closely consulting Thimphu & Phuentsholing Thromdes and MoF

This report (“Business Process Reengineering” or BPR report) caters to the business process reengineering for local revenue collection and management requirement as per the RFP.

Background

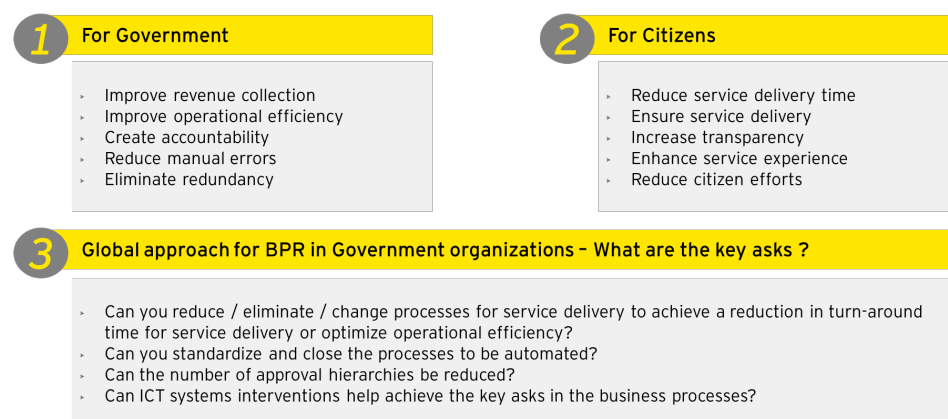
As a part of this phase, the two key outcomes considered as a part of this BPR activity include:

improve efficiency of the revenue collection process
assist MoWHS to implement a citizen friendly system

As per our discussions and secondary research, key business process re-engineering activities for Government sectors focus on the following parameters depicted below diagrammatically:

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Figure 1 - BPR activities in Government sector

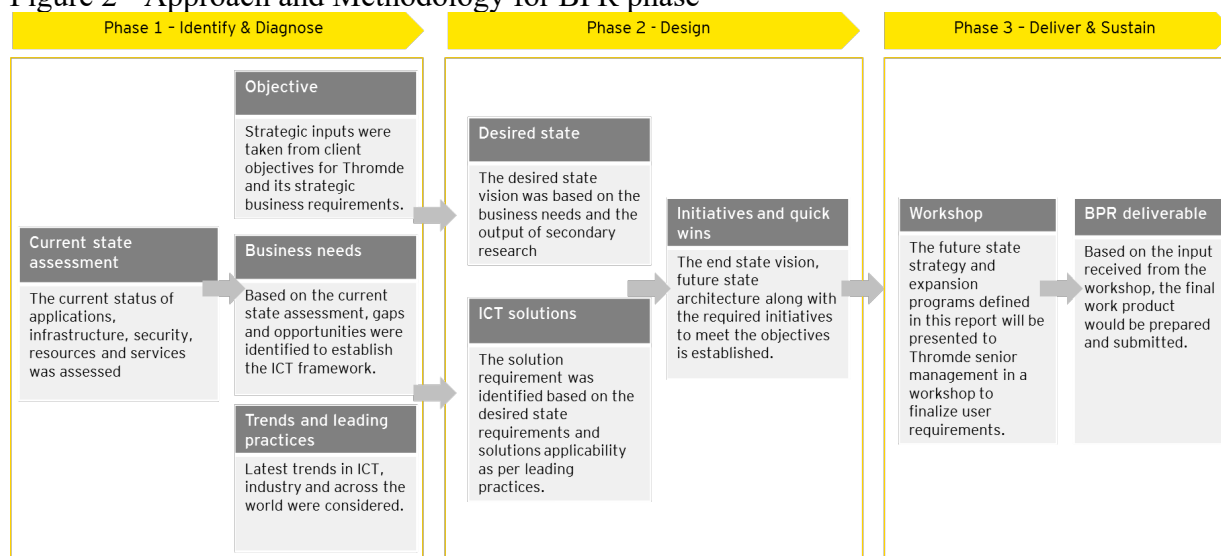


As a part of the BPR and initiatives identification process, the above research study will be considered to arrive at the key recommendations for MoWHS and the two Thromdes (Thimphu and Phuentsholing).

Approach and Methodology

The BPR phase has been broken down into three sub-phases as per the requirements from the RFP as represented below diagrammatically:

Figure 2 - Approach and Methodology for BPR phase



This phase will include two outputs viz. (a) workshops on the BPR and master plan for the Thromdes (b) BPR report.

Current State Assessment

As a part of the current state assessment, business processes around revenue management systems were reviewed and discussed with the two Thromdes (Thimphu and Phuentsholing) including the existing RMS system, the organizational structure &

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adequacy of manpower and supporting infrastructure. The assessment was conducted with the following units / sections / divisions:

Revenue section
Billing unit
Survey and Land division
Urban Planning division
Inspection and Monitoring section
GIS section

As a part of the current state assessment, the adjoining diagram presents the framework for reviewing the two Thromdes. A summary of the current state assessment is presented below in tabular form for Thimphu and Phuentsholing Thromdes (included as a part of the workshop presentation, pages 13 – 31):

Table 1 - Summary of Thromdes current state assessment

Team	Activities	Team Size	Transactions	Service turn-around time
Thimphu Thromde				
Revenue Section	collection of revenue (water bills, land & property taxes, others) through cash, cheque, demand draft and online cash transfer ledger recording maintenance of cash books issue demand notices daily reporting & reconciliation to supervisor and monthly reporting to ES	Total team members – 7	For peak seasons, the section handles ~ 50 transactions a day. On an average day, there are ~ 10 – 15 transactions	Revenue collection typically takes 10 minutes per user to validate, collect taxes and issue receipts Reporting takes 30 minutes Time taken to reconcile daily reports (supervisor) – 5 days per month

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Team	Activities	Team Size	Transactions	Service turn-around time
Billing unit	printing of meter reading sheets collection of meter readings feeding meter readings in FoxPro system generation of water bills distribution of water bills collection of water (cash and cheque) and issuance of receipts	billing and collection team – 2 meter readers – 11 (1 is permanent and others on contract)	Monthly bills are being issued to Thimpu taxpayers. Approximately 3,000 bills are generated monthly	meter reading – 2 – 3 days meter reading data entry in FoxPro system – 1 – 2 weeks bill distribution – 2 – 3 days

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Team	Activities	Team Size	Transactions	Service turn-around time
Survey and Land division	land survey land management including land lease, mortgages and disputes evaluation of applicable taxes coordination with NLCS for registration approval coordination with courts and anti-corruption agencies to freeze lands track tax defaulters and take necessary actions maintain land records (coordination with NLCS for geo-spatial data)	Total team members – 12 which includes land registrars – 6 surveyors – 4 survey engineer – 1 mapper - 1	On an average day, there are ~ 3 – 5 requests per week	A typical cycle takes 2 months approximately. This includes one (1) month of observation post receipt of application, one (1) week for survey and preparation of compliance & recommendation report, two (2) weeks for NLCS decision and one (1) week for final survey and registration.
Urban Planning division	issuance of site plan calculation of tax to be levied proposed changes to precinct reconfiguring / readjusting resolve land issues land pooling	Total team members – 5	Maximum of 50 requests per week of which 30 requests are for issuance of site plans	On an average a complete life-cycle for a request takes 3 – 4 days Minimum lifecycle for a request takes 2 days Maximum time for a lifecycle takes 2 weeks depending on availability of team, request complexity and dependence on third party stakeholders

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Team	Activities	Team Size	Transactions	Service turn-around time
Inspection and Monitoring Section	Field visits building assessment environment clearances compliances property tax evaluation any other ad-hoc requests for inspections	Total team members – 25	Maximum of 15 requests per week	On an average a complete life-cycle for a request takes 4 – 8 hours
GIS section	Spatial data updates for infrastructure, buildings, road and water supply providing data to citizens, engineering and environment teams merging data to create a single source of truth	Total team members – 2	Maximum of 25 requests per day	Depends on the availability of team members and complexity of requests

Phuentsholing Thromde

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Team	Activities	Team Size	Transactions	Service turn-around time
Accounts section	collection of revenue (water bills, land & property taxes, others) through cash, cheque, demand draft ledger recording maintenance of cash books issue demand notices monthly newspaper ads for taxes monthly reporting to ES	Total team members – 5 which includes team lead – 1 revenue collector – 1 accountant – 3	For peak seasons, the section handles ~ 100 transactions a day. On an average day, there are ~ 15 - 20 transactions	Revenue collection typically takes 10 minutes per user to validate, collect taxes and issue receipts Reporting takes 10 - 30 minutes Time taken to reconcile daily reports – 30 minutes Monthly report generation time - ~ 2 hours
Water billing unit	printing of meter reading sheets collection of meter readings feeding meter readings in FoxPro system generation of water bills distribution of water bills collection of water charges (cash) and issuance of receipts	billing and collection team – 2 meter readers – 4	Monthly bills are being issued to Thimpu taxpayers. Approximately 1260 bills are generated monthly	meter reading – 6 days meter reading data entry in system – 1 week bill distribution – 6 days

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Team	Activities	Team Size	Transactions	Service turn-around time
Survey and Land division	land survey land management including land lease, mortgages and disputes evaluation of applicable taxes coordination with NLCS for registration approval coordination with courts and anti-corruption agencies to freeze lands track tax defaulters and take necessary actions maintain land records (coordination with NLCS for geo-spatial data)	Total team members – 11 which includes land registrars – 2 land record assistant - 2 surveyors – 3 survey engineer – 0 (required)	On an average day, there are ~ 3 – 5 requests per week	A typical cycle takes 2 months approximately. This includes one (1) month of observation post receipt of application, one (1) week for survey and preparation of compliance & recommendation report, two (2) weeks for NLCS decision and one (1) week for final survey and registration

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Team	Activities	Team Size	Transactions	Service turn-around time
Urban Planning Division	preparation of structure, local site plan issue of the above plans calculation of tax to be levied proposed changes to precinct reconfiguring / readjusting resolve land issues land pooling, survey and demarcation of plots	Total team members – 4	Maximum of 30 requests per week of which 20 requests are for issuance of site plans	On an average a complete life-cycle for a request takes 7 days Minimum lifecycle for a request takes 2 days Maximum time for a lifecycle takes 2 weeks depending on availability of team, request complexity and dependence on third party stakeholders
Inspection and Monitoring section	Field visits building assessment compliances property tax evaluation any other ad-hoc requests for inspections	Total team members – 4 (building inspectors)	permanent – 2 temporary – 2 – 3 daily visits conducted by all team members	On an average a complete life-cycle to complete one zone survey would take 2 days' time

Global Leading Practices

The global leading practices was undertaken through secondary research based on materials available on the public domain or based on the project experiences of the team. Some of the areas wherein detailed research was presented as a part of the workshop includes:

- trends in similar organizations (city governments) in Government sectors
- ICT sourcing trends
- delivery of ICT projects in Government
- role of ICT in Government sector
- Gartner hype cycle for emerging technologies
- Government enterprise architecture and CIO trends survey

Some of the key takeaways from the global leading practices research as a part of the discussions in the workshop include:

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Table 2 - Summary of global leading practices

Takeaway	Description
Strengthening of the collection centres	Collection centers require robust systems to facilitate fast and responsive transactions Automated notifications through sms and email for demand and receipts Multi-channel payment systems including online payment gateways Secured infrastructure (multi-factor authentication)
Establish standards policies	ICT and Increase in ICT adoption requires a robust foundation of policies and procedures as per international standards on enterprise architecture, information security, service delivery and business continuity
Implement a centralized team	ICT Consolidation of the existing ICT team helps to leverage the people experience and manage / govern outsourced activities and systems
Effective reporting	Provide tools for the planning and strategic divisions to forecast future trends and budgeting requirements and plug revenue leakages
Delivery of IT projects	IT Identify market (Government user) requirements for ICT Constitute a centralized T Steering Committee to review, assess and prioritize investments
Define role of ICT in Government sector	Proactive engagement with stakeholders Transform to a service and advisory based organization Lead research and innovations in technology field High quality and responsive service delivery
Infrastructure and Security	Usage of Government National Data Centers , WAN, Office Productivity tools (HR, Payroll, Finance) Requires implementation of security features to safeguard digital footprint of the systems like multi-factor authentication systems and UTMs / Firewalls Shifting to cloud technologies as and when offered through the Government Data Centers
Gartner cycle emerging technologies	Hype for Short & medium term (0 – 3 years) considerations may include biometric authentication, cloud computing (DC), handheld devices and GIS. Key consideration for a long term (3 – 5 years) strategy may include Big Data, In-Memory Computing and Predictive analytics.

For further details, refer workshop presentation, page 32 – 41.

Challenges

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The challenges have been arrived upon based on the discussions conducted with the management of the two respective Thomdes, observation of the daily activities undertaken by the respective staff of the Thomdes and walkthrough of the prototype of the existing RMS system. The summarized list of challenges is presented below in tabular format (refer workshop presentation pages 42-49):

Table 3 - Summary of list of challenges faced by Thomdes

Team	Challenges
Revenue / Accounts Section	<p>Revenue section does not have a complete view of a taxpayers liability</p> <p>There is limited communication with other divisions on the demand generation</p> <p>Search and retrieve mechanism is time consuming activity</p> <p>Reporting and reconciliation is a time consuming activity</p> <p>Transactions from POS systems is slow due to low bandwidth availability</p> <p>Dishonored cheque from citizens is difficult to track and recover (Personal cheques not accepted in PT)</p> <p>Cash collection systems are prone to human errors in counting</p> <p>There is no system to provide receipts or functionality to track errors made for online transfers</p> <p>There is no provision for security of collection centers</p> <p>There is no notification system for citizens to inform them on demands</p> <p>Data security assistance would be required (Data is maintained in excel sheets which may be accidentally edited / deleted)</p>
Water billing Unit	<p>Shortage of billing team staff. There is currently limited team members who are handling data entry, bill generation and collection</p> <p>Reports are not accurate owing to data quality.</p> <p>There is no UPS backup for computers resulting in loss of effort during data entry All data needs to be entered and then submitted</p> <p>As per policy, all non-functioning meters are required to be replaced after 3 months which is difficult to track. This activity is dependent on the meter readers. FoxPro system does not capture data on non-functioning meters.</p> <p>Collection and data entry is prone to human errors. This leads to loss of revenue.</p> <p>The billing unit is dependent on paper usage (meter reading sheets, bills and receipts)</p> <p>Tracking dishonored cheque is difficult and time consuming activity.</p> <p>Billing consumes a life-cycle of a month (maximum) owing to redundant activities and legacy systems</p> <p>There is no interim save option for entering meter reading data – it should be included instead of having all 100 fields to be submitted (RMS)</p> <p>One meter number entry will bring out similar names under each Thomde (RMS)</p>

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Team	Challenges
Survey and Land Division	<p>There is no system to store and search physical copies of documents</p> <p>There is no system catering to sharing information on tax amounts with Revenue section</p> <p>Identification of due payments and defaulters is time consuming process</p> <p>Officers are required to manually enter data received from applicants into the e-Sakor systems of NLCS</p> <p>Tracking land status (freehold, leasehold, frozen) is error prone and difficult in manual cadastral maps</p> <p>Information exists in silos with the team members</p> <p>Tracking and scheduling of tasks is time consuming and subject to errors and omissions</p> <p>Manual verification and validation of data is time consuming</p> <p>Evaluation of applications requires experience considering the tolerance levels of different systems (GPS and DGPS)</p> <p>Coordination with NLCS (sharing geo-spatial data and approval) requires efforts in terms of tracking and follow up</p> <p>Physical copies for land are to be submitted and requires meetings (physical presence required) which requires time</p>
Urban Planning Division	<p>It is difficult to track the work schedule and activities of the team manually</p> <p>Unavailability of a common urban planning map database. Currently the division uses Auto Cad desktop version.</p> <p>Different rates are applicable for precincts which may result in human errors</p> <p>It is difficult to issue notifications and track land owners and issue reminders. There are over 5,000 plots in Thimpu and 2500 in Phuentsholing</p> <p>Work related information is in siloes with team members</p> <p>The division does not have access to National Cadastral Recadastral Program (NCRP) of National Land Commission</p> <p>Urban Planning Division involves interaction with citizens and other Thromde divisions. Interactions result in reduced time for team to work on their tasks.</p> <p>Issuance of site plans is difficult (as email) as the file size is heavy (approximately 4 mb file)</p> <p>There is a shortage of staff compared to the work load requirement (over 50 transactions per week spread across 5 officers with each transaction turnaround time of 3 – 4 days on an average)</p>

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Team	Challenges
Inspection and Monitoring Division (under Development and Control Division)	Unavailability of data on legacy constructions There is loss of revenue due unavailability of complete database Permanent and semi-permanent building life span regulations tracking and forecasting is time consuming due to manual checks There is no system to enable notification to citizens Scheduling and tracking of team activities is difficult and time consuming Survey of building area is difficult without the availability of DGPS equipment Field visits require redundant efforts as the team is required to note field visit data manually and then enter the data in the reports (spread sheets) There are ad-hoc requests for which planning is not possible and changes are required to the existing schedule Lack of manpower of building inspectors for monitoring building / irregularities. The objective is to have field visits scheduled every day which would require additional 4 team members
GIS section	Information is in siloes due to ESRI ArcGIS desktop versions. It is difficult to coordinate with stakeholders to manage data. Creating a single source of truth requires frequent merging of data Satellite imagery procurement is expensive so 2011 images from Digital Globe is being used. There is no existing GIS team in Phuentsholing. The Thromde prefer to have their own project team to establish a GIS center with at least one expert to support the team members.

Key requirements and solutions have been discussed for each of the above-mentioned challenges and have been taken up as an initiative under the master plan.

Proposed BPR Interventions

The Business Process Re-engineering process was divided into three components:

Functional
Technical
Change Management

As a part of the functional process assessment, the following functional processes were discussed:

Water and Sewerage
Land Tax
Urban House Tax
Under Development Fees
Land Lease
Property Transfer Tax
Building Plan

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Land Allotment

For each of the above processes, challenges & pain areas of the citizens & Thromdes officers, strategic initiatives and possible ICT interventions were identified. The initiatives are consolidated under the Thromdes Master Plan. Refer BPR workshop presentation (pages 51 – 61) for more details on the functional BPR initiatives and proposed interventions.

The summarized view of the BPR recommendations are presented below in tabular format:

Table 4 - Summarized BPR recommendations

Sr#	Process	Observations	BPR Initiatives	ICT initiatives
1	Water and Sewerage	The entire monthly cycle for water bill takes an month with data entry taking the bulk time also there is a high human error possibility on multiple accounts. Also, citizens are required to visit Thromde to pay the taxes. Follow-up on dishonoured cheque requires intensive efforts of the revenue division.	Service delivery quality Introduce online application and payment facility through a common Thromde portal Introduce on-spot meter reading and bill generation thereby reducing bill generation time period Standardization Establish rules for water and sewerage fees computation for automation and reduce human errors Redundancy Eliminate multiple paper-based meter reading and bill distribution process through on-spot bill generation mechanisms by mobile / handheld devices with printers Transparency Introduce provisions for providing tax rates online with email and sms based notifications for bills and payment dates Accountability identify team members for reconciliation rules and system-based reconciliation	Online payment gateway, email and sms notifications, mobile based meter readers and bill generation systems
2	Land Tax	Typical challenges	Service delivery quality Introduce online payment	Online payment

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Sr#	Process	Observations	BPR Initiatives	ICT initiatives
		include a citizen who is required to travel to Thromdes for payment (monthly / annually), maintenance & reconciliation of the transaction registers by Thromde officers.	facility through a common Thromde portal Allow payment facility through multiple collection centers Standardization Conduct review study to establish classification for land category and area Finalize land tax rates, arrears, increment mechanism Redundancy Reduce manual dependency on tax and arrear calculations, receipt generation, cash / cheque collection and maintenance of transaction register Transparency Make data on Owner, Thram, Plot number available online for citizen with payment history and receipt generation features Accountability Identify process and IT application owner for managing business rule changes (tax / arrears)	gateway, Reporting solution, Document management system, Business rules engine
3	Urban House Tax	Typical challenges include a citizen who is required to travel to Thromdes for payment (monthly / annually), maintenance & reconciliation of the transaction registers by	Service delivery quality Introduce online payment facility through a common Thromde portal, Allow payment facility through multiple collection centers Standardization Establish a standard building assessment report checklist Finalize UH tax rates, arrears, change mechanism Redundancy Reduce manual dependency on tax and arrear calculations, receipt	Online payment gateway, Reporting solution, Document management system, Business rules engine, Mobile device for conducting building assessment

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Sr#	Process	Observations	BPR Initiatives	ICT initiatives
		Thromde officers.	generation, cash / cheque collection and maintenance of transaction register, Entering building assessment report in system post site visit Transparency Make data on Owner, Thram, Plot number and occupancy certificate database available online for citizen with payment history and receipt generation features Accountability Identify process and IT application owner for managing business rule changes (tax / arrears)	
4	Urban House Tax	Typical challenges include a citizen who is required to travel to Thromdes for payment (monthly / annually), maintenance & reconciliation of the transaction registers by Thromde officers.	Service delivery quality Introduce online payment facility through a common Thromde portal, Allow payment facility through multiple collection centers Standardization Establish a standard building assessment report checklist Finalize UH tax rates, arrears, change mechanism Redundancy Reduce manual dependency on tax and arrear calculations, receipt generation, cash / cheque collection and maintenance of transaction register, Entering building assessment report in system post site visit Transparency Make data on Owner, Thram, Plot number and occupancy certificate database available online for citizen with payment history and receipt	Online payment gateway, Reporting solution, Document management system, Business rules engine, Mobile device for conducting building assessment

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Sr#	Process	Observations	BPR Initiatives	ICT initiatives
			generation features Accountability Identify process and IT application owner for managing business rule changes (tax / arrears)	
5	Under Development Fees	Typical challenges include a citizen who is required to travel to Thromdes for payment (monthly / annually), maintenance & reconciliation of the transaction registers by Thromde officers, redundancy of efforts for BCD for submitting reports	Service delivery quality Introduce online payment facility through a common Thromde portal Allow payment facility through multiple collection centers Standardization Establish a standard building approval and inspection report Finalize under development fees and change mechanism Redundancy Reduce manual dependency on tax and arrear calculations, receipt generation, cash / cheque collection and maintenance of transaction register, Reduce redundancy of reporting for building approval and inspection report. Transparency Make data on Owner, Thram, Plot number and building approval and inspection report available online for citizen Accountability Identify process and IT application owner for managing business rule changes (tax / arrears)	Online payment gateway, Reporting solution, Document management system, Business rules engine, Mobile device for conducting building approval and inspection report
6	Land Lease	Typical challenges include	Service delivery quality Introduce online application and payment facility through	Online payment gateway,

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Sr#	Process	Observations	BPR Initiatives	ICT initiatives
		exchange of data between NLCS & Survey and Land division and Revenue	a common Thromde portal Connect Thromde RMS with NLCS for data exchange Standardization Standardize long term requirements for forwarding application to NLCS and data sharing formats Redundancy Establish memo format to update revenue records and update database Transparency Make data on application status (with tracking features) available online for citizen Accountability Identify process and IT application owner for managing business rule changes (tax / arrears) from NLCS and Thromdes	Integration / Middleware for data exchange
7	Property Transfer Tax	Typical challenges include exchange of data between NLCS & Survey and Land division and Revenue	Service delivery quality Introduce online application and payment facility through a common Thromde portal Standardization Establish and finalize checklist for evaluation of application (LAP, demarcation, structural norms) Define tax rules to reduce computational time frames Redundancy Establish data models for urban planning, land survey building control to reduce duplication of data Transparency Make data on application status (with tracking features) available online for citizen	Online payment gateway, Workflow engine to streamline processes and workspace for respective divisions/units

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Sr#	Process	Observations	BPR Initiatives	ICT initiatives
			<p>Provide compliance checklist (LAP, demarcation, structural norms) online for citizens</p> <p>Accountability</p> <p>Identify IT leads for respective divisions to assist officers and review online workflows</p>	
8	Building Plan	<p>Typical challenge would include the absence of online payment because of which citizens are bound to a particular location to pay scrutiny and service charge fees</p>	<p>Service delivery quality</p> <p>Introduce online application and payment facility through a common Thromde portal</p> <p>Standardization</p> <p>Establish standardized scrutiny and service charge rates and memo formats</p> <p>Redundancy</p> <p>Reduce duplication of data from the application form submitted</p> <p>Transparency</p> <p>Make data on application status (with tracking features) available online for citizens</p> <p>Accountability</p> <p>Identify process and IT application owner for managing business rule changes (tax / arrears)</p>	<p>Online payment gateway, Online portal for application submission and online receipt generation</p>
9	Land Allotment	<p>Typical challenges include exchange of data between NLCS & Survey and Land division and Revenue and reducing efforts of Thromde officers for</p>	<p>Service delivery quality</p> <p>Introduce online application and payment facility through a common Thromde portal</p> <p>Connect Thromde RMS with NLCS for data exchange</p> <p>Standardization</p> <p>Standardize land allotment fees and compliance requirements with LAP</p> <p>Redundancy</p> <p>Establish data model to identify common data</p>	<p>Online payment gateway, GIS enterprise server for single source of truth</p>

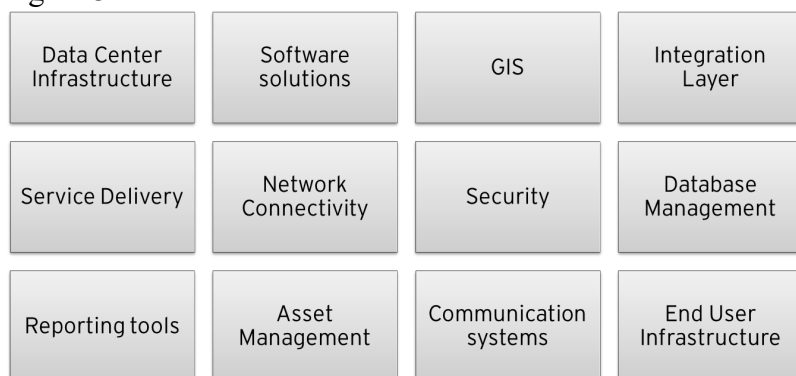
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Sr#	Process	Observations	BPR Initiatives	ICT initiatives
		collaboration and data sharing	requirements for Urban Planning, NLCS, Revenue and Land Records, Establish mechanism to auto-update land record database Transparency Make data on application status (with tracking features) available online for citizen and compliance checklist with LAP Accountability Identify process and IT application owner for managing business rule changes (tax / arrears), land records from Thromdes	

Technical Interventions Proposed

Technical initiatives which act as an enabler to the above-mentioned functional processes were reviewed and certain key initiatives and areas of improvement have been identified as a part of the BPR initiatives available as a part of the BPR workshop presentation (pages 62 - 75). The key technical areas considered include:

Figure 3- Technical intervention areas considered under Thromdes Master Plan



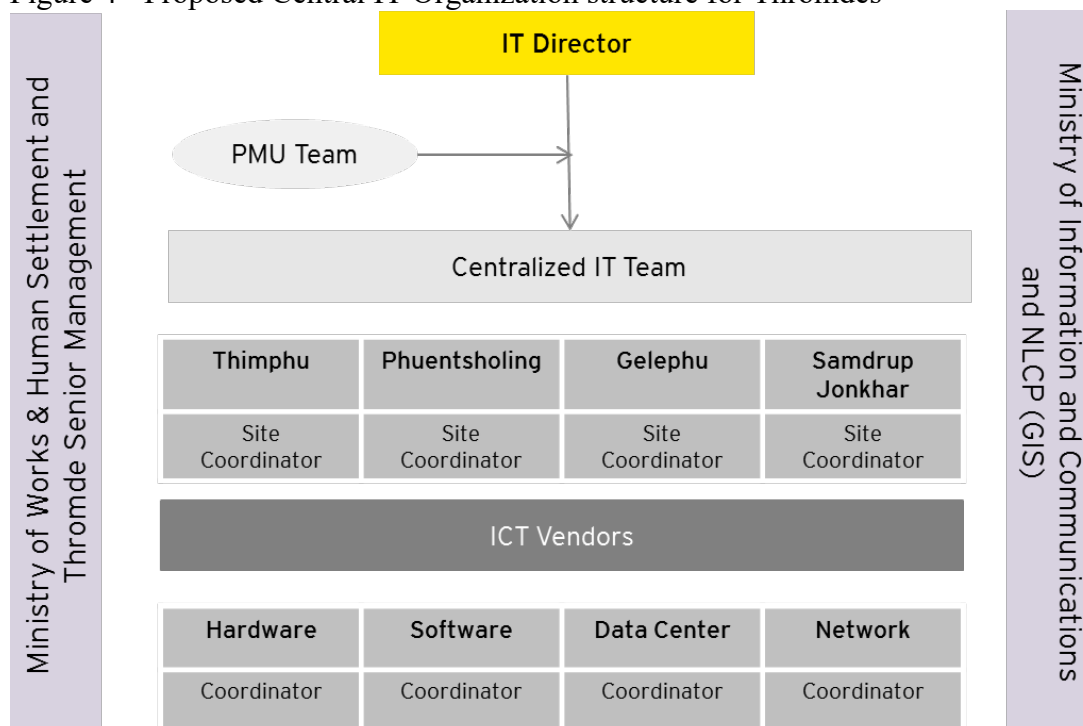
Change Management

Change management protocols have been discussed with the Thromdes senior management considering that with the ICT interventions envisaged, change management would be a critical component in the process to enable Thromde officers to adopt ICT usage seamlessly. Moreover, a centralized IT team has been proposed taken into consideration discussions and pain areas of the ICT team and the Thromde users.

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The overall structure proposed post discussion with the senior management is presented below:

Figure 4 - Proposed Central IT Organization structure for Thromdes



The overall sponsor and accountability of the team could be under one of the following options:

Four Thromdes
MoWHS
MoIC

Out of the three options, the Thromdes (Thimphu and Phuentsholing) would prefer the first two options wherein services are required to be defined along with dedicated service classifications and timelines.

Master Plan

As a part of the master plan development, workshops have been conducted in Thimphu and Phuentsholing with the key stakeholders to arrive at the following outcomes:

identification of a list of forty (40) initiatives
establishing the prioritization parameters for each of the initiatives including:
benefits (revenue collection, optimization of efforts, security, monitoring, management & reporting)

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complexity and risks of execution

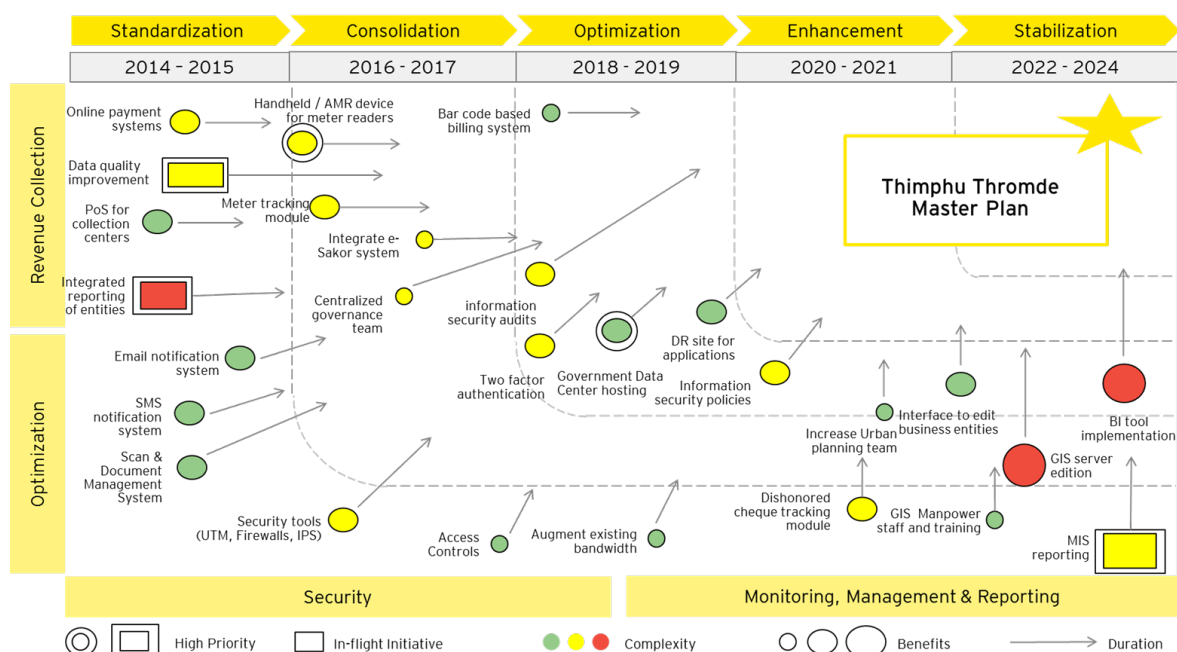
implementation duration

establishing the investment plan for each of the 40 initiatives (in terms of capital and operational expenditures)

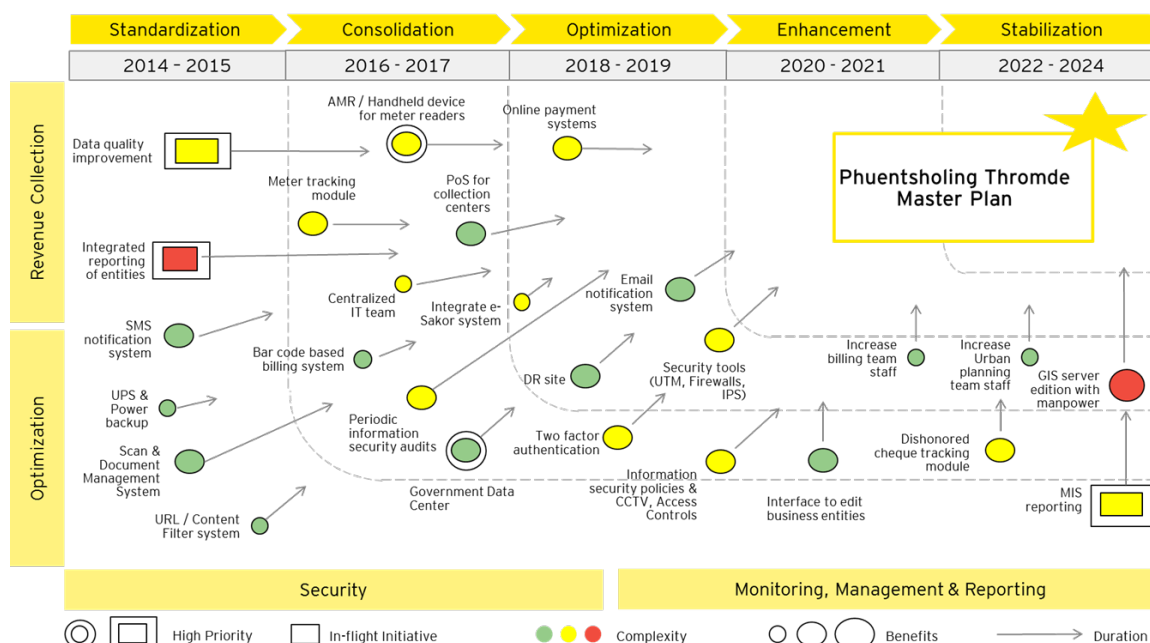
defining a ranking of each of the initiatives as per the on-ground requirements of the respective Thromdes

establishing a ten year Thromdes Master Plan for each of the two Thromdes

The diagrammatic representation of the Master Plans for Thimphu and Phuentshoiling Thromdes are as follows:



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The details on the above e-Governance roadmap for Thromdes are available in the worksheets. The roadmap will serve a high-level guide for establishing the transformation of the Thromdes and this report presents further details for each of the initiatives mentioned above.

Strategy for implementation of BPR initiatives identified under e-Governance roadmap

These initiatives are all implementable but dependent on policies and availability of funds for it. Above all it will depend on the willingness of the employees and drive of the management to successfully implement it. The plan has to be taken up priority wise in phases (every two years or more) and while some initiatives which do not either require time and budget could be take up simultaneously.

In this regard, the Thromdes have identified the phase-wise schedule of initiatives to be considered for implementation. This is presented below. Phases considered from implementation perspective are as follows:

Phase 1 – 2015 onwards

Phase 2 – 2016 onwards

Phase 3 – 2018 onwards

Phase 1 presents the basic list of features which will impact and transform the function of the Thromdes. These initiatives represent the core features expected in a modern Thromde. It is proposed that the same is to be considered by the Thromdes for implementation from 2015 onwards.

Table 5 - Initiatives considered for implementation

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#	Phase	Initiative	Indicative Investment Outlay (in USD millions)	Thimphu Ranking	Phuentsholing Rankings
1	1	SMS gateways	0.015	1	1
2	1	Email gateways	0.014	1	4
3	1	Payment systems	0.006	1	4
4	1	Data Quality Improvements	0.020	1	1
5	1	Document Management System	0.089	1	1
6	1	GIS systems	0.518	2	3
7	1	Information security tools	0.060	1	4
8	1	Introduce handheld / AMR devices for meter readers	0.010	1	3
9	1	Augmenting IT Team	-	2	3
10	2	Integration with NLC database (e-Sakor)	0.002	2	3
11	2	Integrated reporting of all entities	0.030	1	1
12	2	MIS reporting for tracking and monitoring	0.009	2	2
13	2	Dishonoured cheque module	0.002	2	2
14	2	Bandwidth augmentation	0.060	1	Dependent on TWAN
15	2	Data Center	0.090	3	2
16	3	Bar Code billing	0.007	3	2
17	3	Information Security Audit	0.100	3	2
18	3	Two Factor authentication	0.005	4	3
19	3	Disaster Recovery site	0.090	3	3
20	3	Information security policy (ISO 27001)	0.075	4	3
Interim Total Investment Estimates for select initiatives			1.202		
Contingency (@ 25%)			0.300		

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#	Phase	Initiative	Indicative Investment Outlay (in USD millions)	Thimphu Ranking	Phuentsholing Rankings
Total Investment Estimates for select initiatives			1.502		

Assumptions

Investment estimation disclaimer	<p>The cost figures quoted above are the indicative costs for budgeting and have been arrived based on assumptions provided in our work product BUPD II – Master Plan and in discussion. The figures are based on the information available in consultation with ICT Thromdes team and will definitely differ from tender quotations. The validity of these list prices is one month from the data of submission of this work product.</p>
SMS and email payment gateways	<p>For SMS notifications, the central government (DITT & MoIC) has SMS Gateway for G2C services which Thromde is using for G2C Services. The SMS notification uses both the telecom services providers in the country.</p> <p>Email has not been considered as in the past due to unavailability of the gateway but the management has advised to take up during road map discussion and could be explored in similar manner with SMS.</p>
Payment gateway	<p>B-Wallet, the mobile financial transaction service is available through Bank of Bhutan and Bhutan Telecom currently. The service providers will be providing the service but citizens will have to pay a minimal fee for it.</p> <p>Citizens may also use net-banking feature of Bank of Bhutan to make online payment as the Thromde is only allowed to have account with the Bank of Bhutan (National Policy). The Bank of Bhutan has already developed module for utility service payment (water, power and phone) for public.</p> <p>Banks (all the banks in this case) to directly transfer the amount payable to Thromde from clients account upon their consent and minimal fees might be charged by these Banks for the service.</p>
Data quality improvements	<p>Thromdes are currently undertaking data quality checks and validations. The effort and cost estimation is specific as per discussion with the Thromde team.</p>

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Assumptions	
Document management system	One software licence and server cost has been assumed for the estimation. However, additional effort and costs should be considered for integration with RMS and other systems as per requirement.
GIS	NLC has currently provided GIS desktop licenses. It is to be explored with NLC on the issuance of server-based licences for Thromdes. Costs for digitization and addition of map layers not considered for budgeting.
Information security tools	1 application firewall cost estimate used for budgeting
Handheld / AMR devices	Thimphu Thromde is currently considering AMR devices. Alternative option for considering hand held devices (tablets)
Augmenting IT team	Costs have not been estimated as Thromdes plan to leverage existing resources available. Sourcing strategy is also to be explored for the different roles.
Integration with e-Sakor	Considering e-GIF policies, basic integration efforts have been considered. No data migration or design changes / cleansing is taken into consideration
MIS reporting	Thromdes are currently implementing RMS which has basic MIS features. This initiative is focussed on improving the existing reports based on consultation with Thromde management
Dishonoured cheque module	Basic functionality has been considered to track the dishonoured cheque and users. Any additional functionality may require further evaluation of the efforts and cost estimation.
Data Center and Disaster Recovery site	Dedicated Data Center and DR site s not considered for budgetary estimation. As per MoIC directive, shared Data Center and DR hosting has been considered. Actual cost of hosting should be taken up with MoIC prior to hosting.

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4.23	Non-functioning meter tracking system module	80
4.24	Introduce handheld / AMR devices for meter readers	81
4.25	Implement document management system	82
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Abbreviation

Abbreviation	Description
ADB	Asian Development Bank
BPR	Business Process Reengineering
BUDP II	Bhutan Urban Development Project II
FRS	Functional Requirements Specification
G2C	Government to Citizen
GIS	Geographic Information System
ICT	Information and Communication Technology
IT	Information Technology
MoF	Ministry of Finance
MoWHS	Ministry of Works and Human Settlement
NLCP	National Land Commission Program
NLCS	National Land Commission Secretariate
PPD	Planning & Policy Division
PPD	Policy and Planning Division
PT	Phuentsholing Thromde
RGoB	Royal Government of Bhutan
RGoB	Royal Government of Bhutan
RMS	Revenue Management System
ToR	Terms of Reference
TT	Thimphu Thromde
UI	User Interface
UTM	Unified Threat Management
WB	World Bank

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1. Introduction

Bhutan Urban Development Project (“BUDP II”) was initiated through the IDA credit of USD 12 million secured by Royal Government of Bhutan (“RGoB”) with the aim to:

- a. strengthening municipal management systems starting in Thimphu and Phuentsholing
- b. improving infrastructure services in northern Thimphu

BUDP II has the following components:

- a. Component #1: Municipal Finance and Management
- b. Component #2: Thimphu Northern Area Development
- c. Component #3: Capacity Building

1.1 Overview

This project (“Strengthening Municipal Financial Management”) is a key part of Component #1: Municipal Finance and Management. This component through this project aims to strengthen the institutional systems and financial processes of the two Thromdes (city governments) in Bhutan viz. Thimphu and Phuentsholing Thromdes as well as the Ministry of Finance (“MoF”) and the Ministry of Works and Human Settlement (“MoWHS”) to put in place sustainable policy and process framework for financing municipal services. The Policy and Planning Division (“PPD”) of the MoWHS is the implementing agency. It is expected that PPD, MoWHS will be closely consulting Thimphu & Phuentsholing Thromdes and MoF

This report (“Business Process Reengineering” or BPR report) caters to the business process reengineering for local revenue collection and management requirement as per the RFP.

1.2 Objectives

The key objectives for the BPR activity include:

- a. improving the efficiency of revenue collection process
- b. establishing a citizen friendly system

As a part of this phase, through the BPR phase, Governance roadmap for the two Thromdes have been established. The Governance road map for Thimphu and Phuentsholing Thromdes further identifies a list of 40 initiatives in-line with the above objectives spread across a time period of ten years.

1.3 Key stakeholders

The BPR activity required detailed interactions and brainstorming with the following stakeholders:

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- a. Ministry of Works & Human Settlement (MoWHS)
- b. Policy and Planning Division (PPD)
- c. Thimphu Thromde (TT) and Phuentsholing Thromde (PT)
- d. Departments of the respective thromdes
- e. Revenue section
- f. Billing unit
- g. Survey and Land division
- h. Urban planning division
- i. Inspection and Monitoring section
- j. GIS section

1.4 Purpose of this document

The draft report submitted to MoWHS and the two Thromdes contained details on the current state assessment, challenges, global leading practices. This document is intended to present the activities and initiatives undertaken as a part of the BPR phase. The key chapters under this document include:

- a. Introduction
- b. Approach and Methodology
- c. Thromdes Governance Road Map
- d. Detailed description of initiatives under Governance Road Map

1.5 Related documents and references

As a part of drafting this report, following documents and references have been used:

- a. RFP (Ref # MoWHS/BUDPII/C1/MF-Consultant/704)
- b. Inception report submitted by EY dated 9 April 2014
- c. Thromde Rules, 2011 of The Kingdom of Bhutan
- d. Documents shared by iTechnologies for Revenue Management System
- e. BUDP – Revenue Management System DPR
- f. Statistics (5th Edition March 2014) by Ministry of Information and Communications, Royal Government of Bhutan

The next chapter will present details on the approach and methodology considered for undertaking the BPR phase.

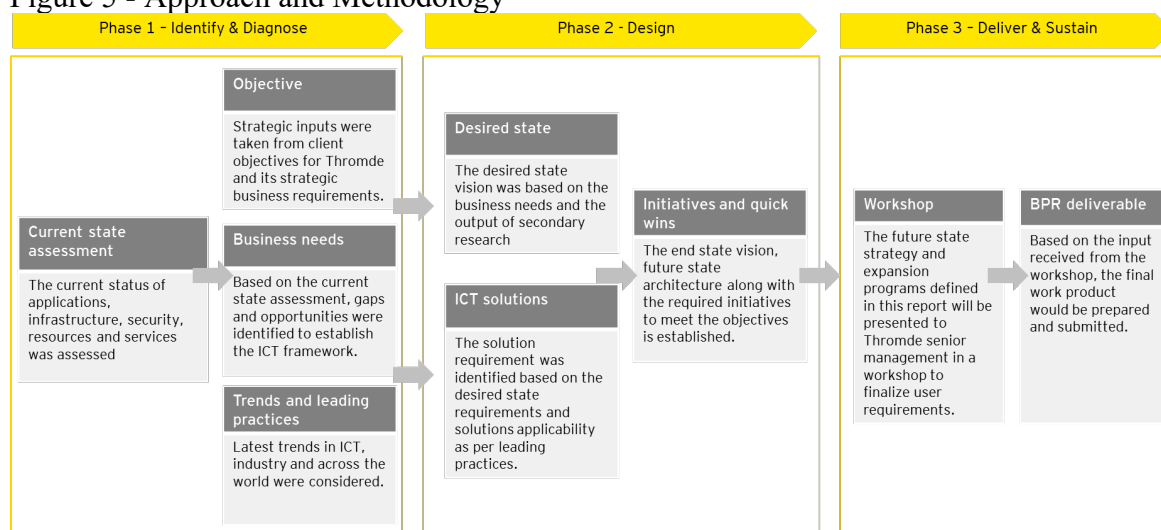
1.6 Approach and Methodology

The BPR component has been divided into three phases as follows:

- a. identify and diagnose
- b. design
- c. deliver and sustain

The activities conducted as a part of the above phases are presented below diagrammatically:

Figure 5 - Approach and Methodology



1.7 Scope

The broad contour of the BPR scope is divided into location, development areas, services and assumptions. The components are presented below in tabular format:

Table 6 - Scope of work

Sr #	Component	Description
1	Location	Thimphu Thromde office Phuentsholing Thromde office Ministry of Works & Human Settlement, Thimphu office
2	Focus areas	Business processes related to collection of local revenue (taxes, charges and fees) Existing systems and procedures for the two Thromdes (Thimphu and Phuentsholing)
3	Services	As-Is study of the existing processes related to the collection of local revenue (taxes, charges and fees) As-Is study of the existing systems including revenue management systems Secondary research on global leading practices in revenue collection and ICT systems Identification of pain areas and challenges in the existing collection processes Re-engineering of existing processes related to collection of local revenue

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Sr #	Component	Description
4	Assumptions	BPR activity will not be covering internal or back-end operations including HR, Finance and Payroll The geographic locations will be limited to Thimphu and Phuentsholing Thromdes for the existing scope of work The system review component will not cover source code review or performance / security reviews Global leading practices study will be based on information available in public domain through secondary research

1.8 Work products

As a part of the BPR phase, the BPR document will be the key deliverable considered as a part of this engagement. In addition to the same, following work products have been prepared and shared with the Thromdes:

- a. Thromde Governance Road Map prioritization framework
- b. Thromde investment layout
- c. Centralized organization structure for the Thromde ICT support team
- d. Draft Business Process Reengineering report

2. Thromdes Governance Road Map

2.1 Initiatives

A list of 40 initiatives has been identified as a part of the workshop and discussions conducted with the senior management of the two respective Thromdes. These initiatives have been aligned to the following themes:

- a. revenue collection
- b. optimization
- c. security
- d. monitoring, management and reporting

The above themes have been discussed with the Thromdes and finalized as the basis for the transformation of the Thromdes aligned to the growth and development vision.

The initiatives are presented below:

Table 7 - Governance roadmap initiatives

No	Initiative Name
1	System user guides within RMS
2	Integrated reporting of all entities
3	Implementation of online payment systems
4	Implementation of PoS at collection centers
5	Implementation of kiosks for payments
6	Implement module to manage dishonored cheques
7	Implement bar-code systems in bills
8	Define security policies for Thromdes
9	Establish physical security for collection centers (CCTV)
10	Establish physical security for collection centers (Access Controls)
11	Establish physical security for collection centers (Security Guards)
12	Implement information security policies (ISO 27001)
13	Implement information security tools (like Firewall and IPS)
14	Implement two factor authentication for critical applications
15	Implement quarterly security audits
16	Implement sms based notification systems

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No	Initiative Name
17	Implement email-based notification systems
18	Augment billing team staff
19	Augment Urban Planning Division team staff
20	Data quality improvements and quality check
21	UPS based systems and power backup (for collection centers)
22	UPS based systems and power backup (for other systems)
23	Non-functioning meter tracking system module
24	Introduce handheld / AMR devices for meter readers
25	Implement document management system
26	Implement MIS reporting for tracking and monitoring
27	Implement Business Intelligence tools for revenue leakage
28	Integration with e-Sakor systems
29	Introduce ESRI ArcGIS server editions for implementation
30	Implement work flow and scheduler-based systems
31	Trained manpower for GIS systems
32	Identify data center for colocation of servers and storage
33	Identify disaster recovery site for data backup
34	Usage of VMs and shared SAN storage space in DC
35	Augment existing bandwidth in Thromdes
36	Introduce redundancy in network connectivity in Thromdes
37	Implement URL / Content Filtering solutions
38	Implement business rules engine / interface for changing tax / user
39	Implement asset management policies and tools to manage assets
40	Establish a centralized governance model to look after shared services

The above list is not in any order of priority. The initiatives have been assessed with the stakeholders based on the above-mentioned themes to establish a prioritized list presented in the subsequent section.

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2.2 Prioritization

The 40 initiatives identified for the respective Thromdes would require an extensive transformation and a big bang approach with respect to implementing all the above initiatives together. Considering the effort and timelines required, a prioritized list of initiatives is required to be established which will guide the Thromdes in terms of the activities for transformation of the internal processes and systems over the next ten years. In this regard, it should be noted that with technology refresh and new regulations and guidelines, the Governance road map for the Thromdes should also be periodically reviewed to identify the impact of the changes in the environment, regulatory systems and technology.

The components considered for establishing a prioritized list is presented below in tabular form:

Table 8 - Initiatives prioritization framework

Sr #	Theme	Component	Options
1	Beneficial quotient	Revenue Collection	Low Medium High
		Optimization	Low Medium High
		Security	Low Medium High
		Monitoring, Management and Reporting	Low Medium High
2	Execution quotient	People	Low Medium High
		Process	Low Medium High
		Technology	Low Medium High
3	Cost Quotient	Capital Expenditure	Software Licenses Hardware Implementation (development) Project Management / Consultancy

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		Operational Expenditure	Software support Hardware support Implementation Support
4	Risk Quotient	Risks	Low Medium High
5	Time Quotient	Timelines	< 6 months (quick wins) 6 – 12 months (short term) 12 – 24 months (mid term) > 24 months (long term)

For each of the above options, quantitative marking scheme has been established to arrive at the top priority initiatives. Based on the above parameters the prioritization list has been derived as presented below:

Table 9 - Governance Road Map Prioritization List

No	Initiative Name	Score	Rating	Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
1	System user guides within RMS	7.74	Medium	4.7	1.0	0.5	1.0	0.5
2	Integrated reporting of all entities	7.60	Medium	6.0	0.5	0.3	0.4	0.4
3	Implementation of online payment systems	6.21	Low	4.3	0.4	0.5	0.6	0.4
4	Implementation of PoS at collection centers	7.65	Medium	4.8	0.8	0.5	1.0	0.5
5	Implementation of kiosks for payments	5.45	Low	3.4	0.6	0.5	0.6	0.3
6	Implement module to manage dishonoured cheques	6.64	Low	3.8	0.9	0.5	1.0	0.5
7	Implement bar-code systems in bills	7.50	Medium	4.6	0.9	0.5	1.0	0.5
8	Define security policies for Thromdes	6.65	Medium	4.0	0.9	0.3	1.0	0.5
9	Establish physical security for collection centres (CCTV)	6.64	Low	3.8	0.9	0.5	1.0	0.5

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No	Initiative Name	Score	Rating	Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
10	Establish physical security for collection centres (Access Controls)	5.99	Low	3.1	0.9	0.5	1.0	0.5
11	Establish physical security for collection centers (Security Guards)	5.92	Low	3.1	1.0	0.3	1.0	0.5
12	Implement information security policies (ISO 27001)	7.01	Medium	4.3	1.0	0.3	1.0	0.4
13	Implement information security tools (like Firewall and IPS)	6.97	Medium	4.3	0.9	0.3	1.0	0.5
14	Implement two factor authentication for critical applications	7.17	Medium	4.3	0.9	0.5	1.0	0.5
15	Implement quarterly security audits	6.70	Medium	4.6	0.9	0.1	0.6	0.5
16	Implement sms based notification systems	7.50	Medium	4.6	0.9	0.5	1.0	0.5
17	Implement email based notification systems	7.50	Medium	4.6	0.9	0.5	1.0	0.5
18	Augment billing team staff	6.38	Low	3.9	1.0	0.1	1.0	0.4
19	Augment Urban Planning Division team staff	5.84	Low	3.3	1.0	0.1	1.0	0.4
20	Data quality improvements and quality check	8.20	High	6.0	0.9	0.3	0.6	0.4
21	UPS based systems and power backup (for collection centres)	6.34	Low	3.3	1.0	0.5	1.0	0.5
22	UPS based systems and power backup (for other systems)	5.60	Low	2.8	1.0	0.3	1.0	0.5

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No	Initiative Name	Score	Rating	Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
23	Non-functioning meter tracking system module	6.42	Low	3.6	0.9	0.5	1.0	0.5
24	Introduce handheld / AMR devices for meter readers	8.29	High	6.4	0.7	0.1	0.6	0.5
25	Implement document management system	6.76	Medium	4.1	0.9	0.3	1.0	0.5
26	Implement MIS reporting for tracking and monitoring	8.33	High	6.0	0.8	0.5	0.6	0.4
27	Implement Business Intelligence tools for revenue leakage	7.63	Medium	6.0	0.6	0.1	0.6	0.3
28	Integration with e-Sakor systems	6.56	Low	4.1	0.9	0.5	0.6	0.5
29	Introduce ESRI ArcGIS server editions for implementation	7.51	Medium	5.3	0.7	0.1	1.0	0.4
30	Implement work flow and scheduler based systems	6.61	Low	3.9	0.7	0.5	1.0	0.5
31	Trained manpower for GIS systems	6.91	Medium	4.3	1.0	0.1	1.0	0.5
32	Identify data center for colocation of servers and storage	7.88	High	5.3	1.0	0.1	1.0	0.5
33	Identify disaster recovery site for data backup	6.58	Low	4.0	1.0	0.1	1.0	0.5
34	Usage of VMs and shared SAN storage space in DC	5.17	Low	2.8	0.9	0.5	0.6	0.4
35	Augment existing bandwidth in Thomdes	7.54	Medium	4.7	1.0	0.3	1.0	0.5
36	Introduce redundancy in network connectivity in Thomdes	5.60	Low	2.8	1.0	0.3	1.0	0.5

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No	Initiative Name	Score	Rating	Bene fit quot ient	Exec ution quoti ent	Cost quot ient	Risk quot ient	Tim e quot ient
37	Implement URL / Content Filtering solutions	6.39	Low	3.7	0.7	0.5	1.0	0.5
38	Implement business rules engine / interface for changing tax / user	6.39	Low	3.7	0.7	0.5	1.0	0.5
39	Implement asset management policies and tools to manage assets	6.07	Low	3.3	0.7	0.5	1.0	0.5
40	Establish a centralized governance model to look after shared services	5.75	Low	3.4	0.8	0.5	0.6	0.4

A detailed calculation for the above table is available in the workshop worksheet available as an annexure to this report.

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3. Investment Plan

Estimated costing for the 40 initiatives has been established in the prioritization worksheet. This has been given due weightage in the above table under the cost quotient. The investment plan is divided into two sub-components as presented below:

Table 10 - Investment Plan components

Sr #	Component	Sub-Component
1	Capital Expenditure	Software license Hardware infrastructure Implementation (manpower rates) Project Management (professional fees)
2	Operational Expenditure	Software license support costs Hardware AMC costs Implementation support costs

The operational expenditures have been established for a period of three years. Considering the technology refresh cycle, inflation and other environmental changes, it is important to review the costs every year to identify impacts and make appropriate adjustments. The operation expenditures have been considered for a period of three years which is an industry standard in ICT sector. It should be noted here that the manpower rates have been prepared based on global average rates and Thromdes may change the same as per the local conditions. It should be noted that the prices provided may vary depending on local environment and availability of select resources. The budgetary estimates have been presented post discussion with the stakeholders and may require further discussions prior to implementation procedures to identify appropriate requirements and services.

The summarized Capital & Operational expenditure costs and the total costs are presented below:

Table 11 - Investment Plan

Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+	Total (USD Million)	Justification
1	System user guides within RMS	1,000.00	-	1,000.00		0.0010	One technical writer for 2 months
2	Integrated reporting of all entities	30,000.00	-	30,000.00		0.0300	5 developers for 12 months

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Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+	Total (USD Million)	Justification
3	Implementatio n of online payment systems	4,000.00	1,800.00	5,800.00		0.0058	2 developers for 1 month
4	Implementatio n of PoS at collection centers	6,500.00	2,700.00	9,200.00		0.0092	8 POS equipment and 1 developer for 1 month
5	Implementatio n of kiosks for payments	10,000.00	3,600.00	13,600.00		0.0136	4 Kiosks and 4 technical resources for 4 Thromdes
6	Implement module to manage dishonored cheques	2,000.00	-	2,000.00		0.0020	2 developers for 2 months
7	Implement bar-code systems in bills	4,600.00	2,520.00	7,120.00		0.0071	2 bar code readers for 4 Thromdes
8	Define security policies for Thromdes	37,500.00	-	37,500.00		0.0375	3 consultants for three months
9	Establish physical security for collection centers (CCTV)	7,800.00	3,960.00	11,760.00		0.0118	2 CCTV each for 4 Thromdes
10	Establish physical security for collection centers (Access Controls)	4,000.00	2,100.00	6,100.00		0.0061	2 Access Controls each for 4 Thromdes

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Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+ Total (USD Million)	Justification
11	Establish physical security for collection centers (Security Guards)	-	18,000.00	18,000.00	0.0180	1 Security Guard each for 4 Thomdes
12	Implement information security policies (ISO 27001)	75,000.00	-	75,000.00	0.0750	3 consultants for six months
13	Implement information security tools (like Firewall and IPS)	41,666.67	18,750.00	60,416.67	0.0604	1 application firewall equipment
14	Implement two factor authentications for critical applications	2,500.00	2,450.00	4,950.00	0.0050	1 biometric scanner each for 4 Thomdes
15	Implement quarterly security audits	1,00,000.00	-	1,00,000.00	0.1000	4 quarterly security audit every year for 3 years
16	Implement SMS based notification systems	8,500.00	6,300.00	14,800.00	0.0148	12,000 sms to be issued per year and 1 developer for 2 months
17	Implement email-based notification systems	9,333.33	5,000.00	14,333.33	0.0143	1 developer for 2 months
18	Augment billing team staff	-	1,20,000.00	1,20,000.00	0.1200	1 billing team resource each for 4 Thomdes

Business Process Re-engineering Report

Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+ Total (USD Million)	Justification
19	Augment Urban Planning Division team staff	-	1,20,000.00	1,20,000.00	0.1200	1 Urban Planning team resource each for 4 Thromdes
20	Data quality improvements and quality check	-	20,000.00	20,000.00	0.0200	1 data entry operator each for 4 Thromdes for 1 year
21	UPS based systems and power backup (for collection centers)	1,000.00	450.00	1,450.00	0.0015	2 UPS each for 4 Thromdes
22	UPS based systems and power backup (for other systems)	12,500.00	5,625.00	18,125.00	0.0181	25 UPS each for 4 Thromdes
23	Non-functioning meter tracking system module	2,000.00	-	2,000.00	0.0020	2 resources for 2 months
24	Introduce handheld / AMR devices for meter readers	90,666.67	9,250.00	99,916.67	0.0999	5 handheld devices each for 4 Thromdes
25	Implement document management system	57,500.00	31,350.00	88,850.00	0.0889	1 software license and 1 enterprise server
26	Implement MIS reporting for tracking and monitoring	9,000.00	-	9,000.00	0.0090	3 developers for 6 months

Business Process Re-engineering Report

Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+ Total (USD Million)	Justification
27	Implement Business Intelligence tools for revenue leakage	2,20,000.00	1,05,000.00	3,25,000.00	0.3250	1 BI software & reporting license with development and sw maintenance team
28	Integration with e-Sakor systems	1,500.00	-	1,500.00	0.0015	1 developer for 3 months
29	Introduce ESRI ArcGIS server editions for implementation	3,29,000.00	1,89,000.00	5,18,000.00	0.5180	2 enterprise server license
30	Implement work flow and scheduler-based systems	1,000.00	-	1,000.00	0.0010	1 developer for 2 months
31	Trained manpower for GIS systems	-	1,08,000.00	1,08,000.00	0.1080	1 GIS team member for each Thromde
32	Identify data center for colocation of servers and storage	-	90,000.00	90,000.00	0.0900	Colocation cost for 1 42U rack in a national data center
33	Identify disaster recovery site for data backup	-	90,000.00	90,000.00	0.0900	Colocation cost for 1 42U rack in a national DR site

Business Process Re-engineering Report

Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+	Total (USD Million)	Justification
34	Usage of VMs and shared SAN storage space in DC	-	-	-	-	-	Proposing existing server VMs and DC cloud services (IAAS)
35	Augment existing bandwidth in Thomdes	-	60,000.00	60,000.00	0.0600	0.0600	Increase the existing bandwidth for 4 Thomdes
36	Introduce redundancy in network connectivity in Thomdes	-	19,200.00	19,200.00	0.0192	0.0192	Add a redundant network connectivity with half bandwidth
37	Implement URL / Content Filtering solutions	2,500.00	1,500.00	4,000.00	0.0040	0.0040	25 licenses each for 4 Thomdes for 3 years
38	Implement business rules engine / interface for changing tax / user	3,000.00	-	3,000.00	0.0030	0.0030	2 developers for 3 months for additional changes
39	Implement asset management policies and tools to manage assets	3,666.67	1,000.00	4,666.67	0.0047	0.0047	1 technical resource each for 4 Thomdes
40	Establish a centralized governance model to look after shared services	-	-	-	-	-	Policy level decision to be taken up with MoWHS and MICT

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Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+	Total (USD Million)	Justification
	Total Investment Layout (in USD)	10,77,733.33	10,37,555.00	21,15,288.33		2.12	
	Total Investment Layout (in USD millions)	1.08	1.04	2.12			

For further details and detailed calculations, refer BUDP II – Master Plan worksheet available as annexure to this report.

3.1 Consolidated rankings and dashboard for Thromdes

The initial prioritization matrix had been established based on the consolidated evaluation and assessment of the themes and the respective components described in the previous sections. A separate exercise was undertaken with the respective Thromde senior management to identify the on-ground requirements which will deliver value and benefits to the Thromde and the citizens irrespective of the costs and risks involved. The same has been presented below.

Rakings nomenclature adopted is as follows:

- a. Rank 1 – Very High priority initiatives which are to be initiated by 2015
- b. Rank 2 – High Priority initiatives which are to be initiated by 2016
- c. Rank 3 – Medium Priority initiatives which are to be initiated by 2018
- d. Rank 4 – Low Priority initiatives which are to be initiated by 2020
- e. Rank 0 – Indicated that this initiative is not applicable for the respective Thromde

The nomenclature is as per the discussions with the Thromdes senior management and is based on current on-field requirements. However, the same needs to be reviewed annually to identify impact of the initiatives and accordingly re-evaluated.

Table 12 - Consolidated ranking of initiatives

No	Initiative Name	Score	Rating	TT Ranking	PT Ranking
1	System user guides within RMS	7.74	Medium	2	3
2	Integrated reporting of all entities	7.60	Medium	1	1

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No	Initiative Name	Score	Rating	TT Ranking s	PT Ranking s
3	Implementation of online payment systems	6.21	Low	1	4
4	Implementation of PoS at collection centers	7.65	Medium	1	3
5	Implementation of kiosks for payments	5.45	Low	4	4
6	Implement module to manage dishonored cheques	6.64	Low	2	2
7	Implement bar-code systems in bills	7.50	Medium	3	2
8	Define security policies for Thromdes	6.65	Medium	4	3
9	Establish physical security for collection centers (CCTV)	6.64	Low	0	3
10	Establish physical security for collection centers (Access Controls)	5.99	Low	1	4
11	Establish physical security for collection centers (Security Guards)	5.92	Low	4	4
12	Implement information security policies (ISO 27001)	7.01	Medium	4	3
13	Implement information security tools (like Firewall and IPS)	6.97	Medium	1	4
14	Implement two factor authentications for critical applications	7.17	Medium	4	3
15	Implement quarterly security audits	6.70	Medium	3	2
16	Implement sms based notification systems	7.50	Medium	1	1
17	Implement email-based notification systems	7.50	Medium	1	4
18	Augment billing team staff	6.38	Low	0	3
19	Augment Urban Planning Division team staff	5.84	Low	2	4

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No	Initiative Name	Score	Rating	TT Ranking s	PT Ranking s
20	Data quality improvements and quality check	8.20	High	1	1
21	UPS based systems and power backup (for collection centers)	6.34	Low	0	1
22	UPS based systems and power backup (for other systems)	5.60	Low	0	0
23	Non-functioning meter tracking system module	6.42	Low	1	2
24	Introduce handheld / AMR devices for meter readers	8.29	High	1	3
25	Implement document management system	6.76	Medium	1	1
26	Implement MIS reporting for tracking and monitoring	8.33	High	2	2
27	Implement Business Intelligence tools for revenue leakage	7.63	Medium	4	0
28	Integration with e-Sakor systems	6.56	Low	2	3
29	Introduce ESRI ArcGIS server editions for implementation	7.51	Medium	2	3
30	Implement work flow and scheduler-based systems	6.61	Low	0	4
31	Trained manpower for GIS systems	6.91	Medium	1	3
32	Identify data center for colocation of servers and storage	7.88	High	3	2
33	Identify disaster recovery site for data backup	6.58	Low	3	3
34	Usage of VMs and shared SAN storage space in DC	5.17	Low	4	3
35	Augment existing bandwidth in Thromdes	7.54	Medium	1	0
36	Introduce redundancy in network connectivity in Thromdes	5.60	Low	0	0
37	Implement URL / Content Filtering solutions	6.39	Low	0	1

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No	Initiative Name	Score	Rating	TT Ranking s	PT Ranking s
38	Implement business rules engine / interface for changing tax / user	6.39	Low	3	2
39	Implement asset management policies and tools to manage assets	6.07	Low	0	0
40	Establish a centralized governance model to look after shared services	5.75	Low	2	3

The above data has been used to establish the individual Governance Road Map for the respective Thromdes. The ten-year Governance road map for Thimphu and Phuentsholing Thromdes is presented below:

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Figure 6 - Governance Road Map for Thimphu Thromde

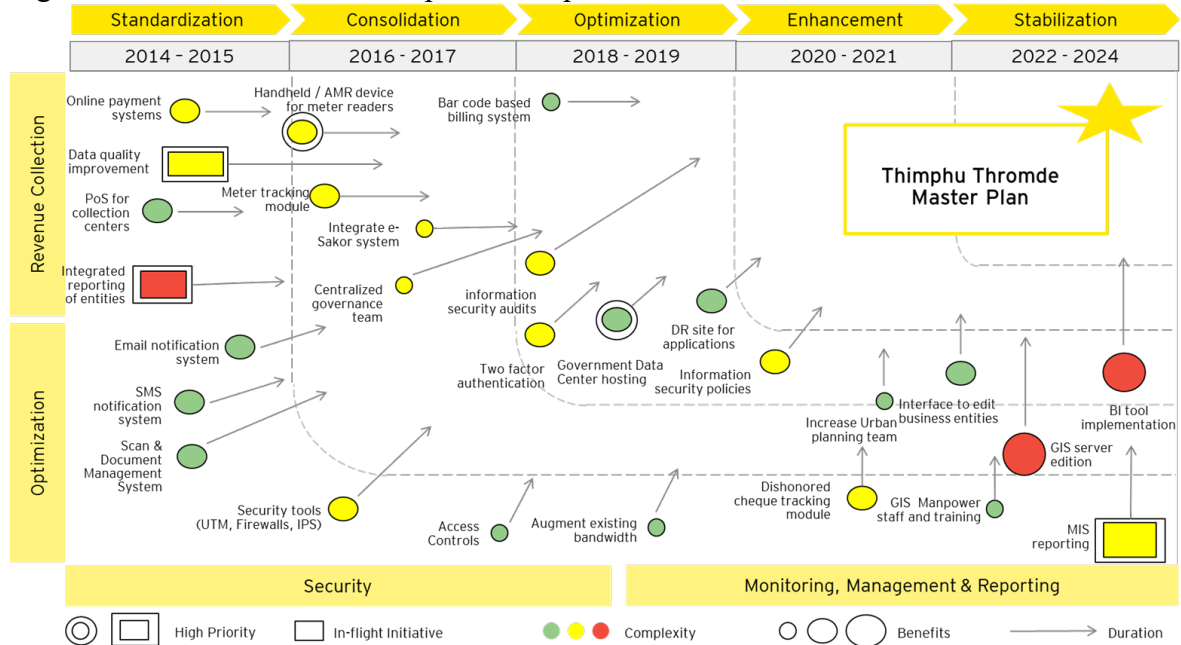
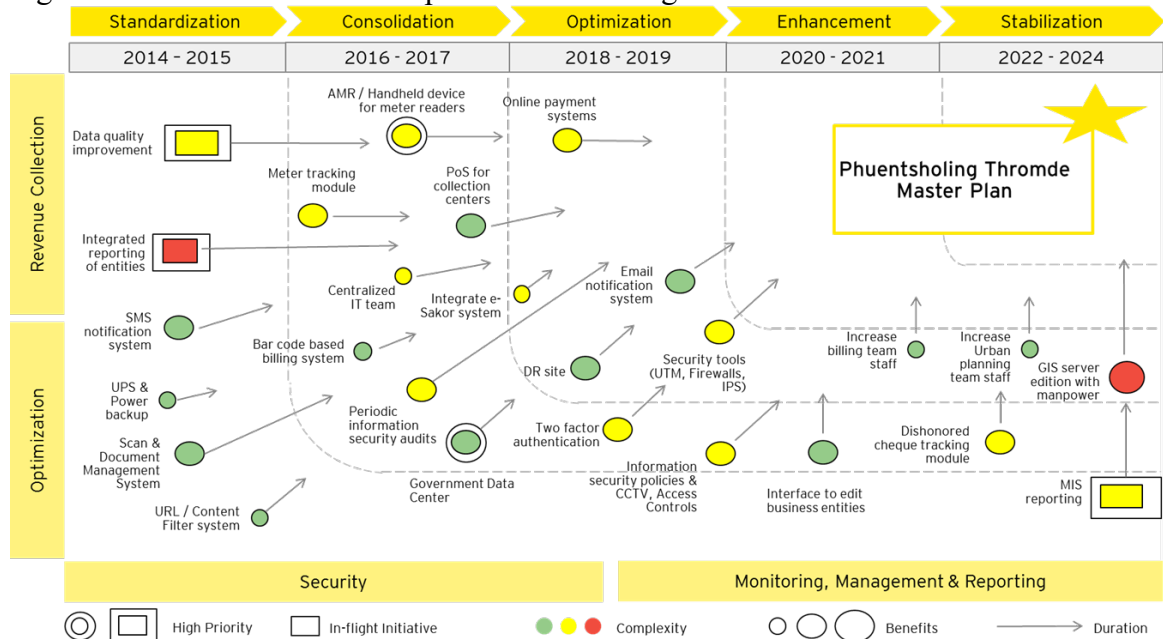


Figure 7 - Governance Road Map for Phuentsholing Thromde



The above individual initiatives have been described in further details in the next chapter.

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4. Detailed description of initiatives under Governance Road Map

4.1 System user guide

Initiative	System user guide					
Phase	Score	Rating	TT Rank	PT Rank		
1	7.74	Medium	2	3		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.7	1.0	0.5	1.0	0.5		
Description of Initiative						
Overview	User guides assist system users to understand and get acclimatised to the system					
Objective	Implement user guides for Thromde officers to use RMS					
Rationale	Change management is a key component in the transformation of the operations of Thromde. System user guide is intended to ease the operational change management.					
Business Benefits	This will enable Thromdes to reduce cost to be incurred on change management including training and handholding. Users would be able to start accessing the system in a shorter time frame independently.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	1	System user guides within RMS	1,000.00	-	1,000.00	0.0010
Risk Assessment	Not applicable					
Technical aspect	Not applicable					
Timelines	Estimated 2 months					
Skill requirements	One Technical writer					
Dependencies & Assumptions	None					
Thromdes Expectations	The user guides should be built into the system (RMS) instead of being a separate document.					

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4.2 Integrated reporting of all entities

Initiative	Integrated reporting of all entities					
Phase	Score		Rating	TT Rank		PT Rank
1	7.60		Medium	1		1
Benefit quotient	Execution quotient		Cost quotient	Risk quotient		Time quotient
6.0	0.5		0.3	0.4		0.4
Description of Initiative						
Overview	Availability of information is an essential requirement for the Thromdes. A Thromde officer (billing unit & revenue division) should have a holistic and comprehensive view of the user database across all divisions, fees, taxes and defaults.					
Objective	Integrate information availability of entities identified within RMS system. An entity will include a citizen, property, areas, divisions, AMR / water meter and other ground level components.					
Rationale	Integrated view of all divisions with respect to entities (citizens) will improve management and reporting.					
Business Benefits	This is turn will help plugging gaps in revenue leakage.					
Cost Analysis	I d	INITIATIVE	Capex Total (USD)	Opex (USD)	Total	Total (Capex Opex) (USD) + Total in USD Million
	2	Integrated reporting of all entities	30,000.00	-		30,000.00 0.0300
Risk Assessment	This is a fairly complex task and would require extensive knowledge of the existing system schema and functionality.					
Technical aspect	Highly skilled technical resources required with understanding and experience of database and application level integration. Existing system is expected to have these features. This needs to be further assessed post completion of roll-out and one year of stabilization for further development.					
Timelines	12 months					
Skill requirements	5 Developers					
Dependencies & Assumptions	This is dependent on the roll-out and stabilization of the existing version of RMS.					
Thromdes Expectations	Thromde officers (revenue & billing unit) should have a comprehensive view of the citizen liabilities. Management is required to have a consolidated view of the performances of all divisions and revenue management across their respective Thromdes.					

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4.3 Implementation of online payment systems

Implementation of online payment systems						
Initiative	Implementation of online payment systems					
Phase	Score	Rating	TT Rank	PT Rank		
1	6.21	Low	1	4		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.3	0.4	0.5	0.6	0.4		
Description of Initiative						
Overview	Online payment systems allow a citizen to pay applicable taxes, fees and charges without having to visit the Thromde offices. This could be through net banking or payment gateway systems.					
Objective	Visits required by a citizen to a Thromde office should be reduced.					
Rationale	Payment and collection centers are one of the critical business functions for the Thromdes. It has been discussed that during end of season or month, there is a heavy workload which results in human errors and loss of revenue. Also a citizen is required to travel to a Thromde every month for payment of water bill. These may be addressed through the implementation of online payments.					
Business Benefits	Revenue loss for manual errors to reduce. Reconciliation would be easier through systems. Citizens would be able to make payments at ease hence collections is expected to go up and day sales outstanding may reduce or reported.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	3	Implementation of online payment systems	4,000.00	1,800.00	5,800.00	0.0058
Risk Assessment	Online payment systems are preferably implemented through a payment gateway. Payment gateways should be secured. Security standards for payment card industry have been established under PCI DSS and it is recommended that the service provider should conduct PCI security scan as per compliance requirements of PCI DSS through an Approved Scanning Vendor (ASV).1					
Technical aspect	It is proposed that payment gateway services should be taken up by the Thromdes based on availability in Bhutan under due approval from the regulatory authorities. Integration with payment gateway is envisaged with due payment services as per requirement for all taxes, fees and charges. A citizen should be provided the functionality to make payments for all applicable taxes, fees and charges required by the municipality. Reconciliation modules should also be implemented to reduce effort and time consumed for the reporting					

¹ Source: <https://www.pcisecuritystandards.org/> last accessed on 15 January 2015

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Initiative	Implementation of online payment systems
	and reconciliation activities. The module should be inter-linked with the defaults module to identify defaulters during the reporting cycles. Prior to integration, security aspect should be considered as per the risk assessment suggestions to ensure compliance to PCI DSS standards and guidelines.
Timelines	1 month estimated
Skill requirements	2 developers - Integration experience resources required with security and compliance understanding of PCI DSS standards and guidelines.
Dependencies & Assumptions	Legal approval for using payment systems Availability of online payment gateway service providers
Thromdes Expectations	In the event of non-availability of payment gateways, net banking and transfer is to be considered along with other options like standing bank instructions with auto-debit for improved convenience. However, this would require manual interventions for reporting and reconciliations.

4.4 Implementation of PoS at collection centers

3.4 Implementation of PoS at collection centers						
Initiative		Implementation of PoS at collection centers				
Phase	Score	Rating	TT Rank	PT Rank		
1	7.65	Medium	1	3		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.8	0.8	0.5	1.0	0.5		
Description of Initiative						
Overview	Point of Sales (POS) machines allow citizens to make payments at collection centers through the cards.					
Objective	Providing users with multiple modes of payments like card payment					
Rationale	Cash collection has multiple disadvantages like reconciliation, counting errors and end of day reporting and validations. This leads to loss of revenue or additional investment of time and efforts for reporting and reconciliation. This may be reduced through POS systems.					
Business Benefits	Reduction in revenue leakage.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	4	Implementation of PoS at collection centers	6,500.00	2,700.00	9,200.00	0.0092

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Initiative	Implementation of PoS at collection centers
Risk Assessment	<p>POS systems are subjected to multiple risks. Some of the scenarios include²:</p> <ul style="list-style-type: none"> a) POS device is hacked b) network communications (LAN / WiFi) is hacked c) breach of the server catering to family of POS devices d) data exfiltration <p>Some of the proposed risk mitigation guidelines for the above include:</p> <ul style="list-style-type: none"> a) Chip and PIN cards b) limit access to internet c) routinely delete card holder data d) disallow remote access e) latest OS versions and patches
Technical aspect	POS devices require network connectivity. This has been taken up in the past. However, due to limited network bandwidth there difficulties in successfully carrying out a transaction. In the event of taking up this initiative, it is important to consider upgrading of network and configuration of device. It is proposed 8 devices be considered for the four Thromdes.
Timelines	1 month tentatively
Skill requirements	1 technical resource cum developer for roll-out
Dependencies & Assumptions	<p>Bandwidth considerations</p> <p>POS device should have option to connect on WiFi / LAN</p> <p>Security of network at the Thromdes</p> <p>Monitoring and security of the POS devices to avoid social re-engineerings</p>
Thromdes Expectations	None

4.5 Implementation of kiosks for payments

Initiative	Implementation of kiosks for payments			
Phase	Score	Rating	TT Rank	PT Rank
1	5.45	Low	4	4
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
3.4	0.6	0.5	0.6	0.3
Description of Initiative				
Overview	A kiosk may be considered as a self-help cum payment device. A			

² Source: https://www.pcisecuritystandards.org/documents/skimming_prevention_IS.pdf last accessed on 15 January 2015

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Initiative	Implementation of kiosks for payments					
	citizen can enter their bill / id in the kiosk to retrieve his dues and make payments (cards or cash) and receive payments. Functionality of kiosks may vary as per requirements of the Thromdes. A kiosk may also be provisioned as customer self-help to provide information to a citizen on the dues and other notices.					
Objective	Allow a citizen to make payments without the involvement of a Thromde officer.					
Rationale	Kiosks can undertake multiple roles (payment and customer help) which in turn will reduce the efforts of the revenue and billing team. Information is available for the citizen irrespective of the availability of a Thromde officer.					
Business Benefits	Reduce revenue leakage due to manual errors Reduce time and effort of Thromde officers					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	5	Implementation of kiosks for payments	10,000.00	3,600.00	13,600.00	0.0136
Risk Assessment	Kiosks require network connectivity and include sensitive information on financial data of Thromdes and citizens. Also the physical security of a kiosk is of concern.					
Technical aspect	<p>Functionality of a kiosk is to be decided by the respective Thromdes based on which the system design and costs will be dependent on. Some of the options available to consider a kiosk include:</p> <ul style="list-style-type: none"> a. information service provider b. payment system (cash or card) c. bill view d. bill printing e. token for queue / submission of bills in collection centers <p>The same needs to be encoded in the kiosk machine prior to commissioning. Also network connectivity is required for a Kiosk.</p>					
Timelines	Timelines will be dependent on the functionality selected and availability of kiosks in Bhutan					
Skill requirements	This is dependent on the availability of kiosk manufacturers who would be required to commission and roll-out in the four thromdes.					
Dependencies & Assumptions	Availability of network bandwidth and security is to be considered.					
Thromdes Expectations	None.					

Business Process Re-engineering Report

4.6 Implement module to manage dishonoured cheques

No. Implement module to manage dishonoured cheques							
Initiative	Implement module to manage dishonoured cheques						
Phase	Score		Rating	TT Rank		PT Rank	
2	6.64		Low	2		2	
Benefit quotient	Execution quotient		Cost quotient	Risk quotient		Time quotient	
3.8	0.9		0.5	1.0		0.5	
Description of Initiative							
Overview	Cheque payment is allowed in Thromdes. If cheques are dishonoured, then the Thromdes are required to follow-up on collection of payments applicable.						
Objective	Establish a system based efficient tracking mechanism for dishonoured cheques						
Rationale	Tracking and recovering of collections against dishonoured cheques is a time and effort consuming tasks. Revenue loss also takes place due to manual errors. This module will assist the Thromde officers to track and identify due payments.						
Business Benefits	Outstanding collections can be improved through effective tracking of dishonoured cheques.						
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million	
	6	Implement module to manage dishonored cheques	2,000.00	-	2,000.00	0.0020	
Risk Assessment	None						
Technical aspect	Following sub-modules are envisaged as a part of the dishonoured cheque tracking module: (a) reporting to present list of outstanding collections for dishonoured cheque (b) integration with collection screen to identify any outstanding collections against dishonored cheque (c) interface to enter details pertaining to dishonoured cheque (d) printing notice and alerting registered users(sms, email and letter) on dishonoured payments						
Timelines	2 months estimated for development						
Skill requirements	2 developers						
Dependencies & Assumptions	RMS system to be stabilized and operational Database should capture contact details (sms, email and postal address) of the payee Integration with sms and email gateways Developers should have understanding of the collection module						

Business Process Re-engineering Report

Initiative	Implement module to manage dishonoured cheques
	database and application to implement trigger to identify cases of outstanding dishonoured cheque payments
Thromdes Expectations	System should be able to assist Thromde officers to identify and report outstanding dishonoured cheque collections

4.7 Implement bar-code systems in bills

Initiative	Implement bar-code systems in bills					
Phase	Score	Rating	TT Rank	PT Rank		
3	7.50	Medium	3	2		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.6	0.9	0.5	1.0	0.5		
Description of Initiative						
Overview	Bar-coded bills enable a user to uniquely identify a bill and avoid duplication. Bar-codes are imprinted on the bills and require bar-code readers to identify bill numbers.					
Objective	Enable Thromde Revenue division and collection centers to uniquely identify bills					
Rationale	Bill numbers are long alpha-numeric characters. Bill numbers are required to be entered into the RMS system to retrieve the bill information. Any typing error leads to retrieval of incorrect bill and accrual in certain cases. A bar-coded bill would reduce the manual errors.					
Business Benefits	Error in entering bill number may result in incorrect collection of cash at the counter or require additional time and effort to rectify mistake in collections. Bar-coded billing system will plug manual errors and reduce efforts required to rectify errors.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	7	Implement bar-code systems in bills	4,600.00	2,520.00	7,120.00	0.0071
Risk Assessment	Implementation of bar-coded system reduces risk of errors in collection due to human errors. Br-coded readers may not function if the bill is soiled, crumpled or tampered with. Hence alternately, bill numbers should be clearly printed as a back-up measure.					
Technical aspect	Components involved for implementing bar-coded billing system: a) bar-code readers b) bar-code software c) bar-code printers					
Timelines	Dependent on the availability and procurement of bar code systems and integration time of additional 1 month					

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Initiative	Implement bar-code systems in bills
Skill requirements	Support required from a bar-code service provider or an experienced system integrator
Dependencies & Assumptions	None
Thromdes Expectations	Manual errors in collection of revenue should decrease.

4.8 Define security policies for Thromdes

Initiative		Define security policies for Thromdes				
Phase	Score	Rating	TT Rank	PT Rank		
3	6.65	Medium	4	3		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.0	0.9	0.3	1.0	0.5		
Description of Initiative						
Overview	<div><input type="checkbox"/>The ISO/IEC 27001:2013 Standard adopts a process approach for defining an organization's Information Security Management System (ISMS).</div> <div><input type="checkbox"/>This initiative is proposed as a new management system for Thromdes and Government of Bhutan, thereby, framing a process and risk based information security management system.</div>					
Objective	To define a benchmark for security guidelines and practices for Thromdes					
Rationale	<div><input type="checkbox"/>Scope of enforceable information security policies and procedures does not address all information security areas.</div> <div><input type="checkbox"/>Policy management processes (e.g., communications, exception management) are not completely documented, which reduces the clarity on obtaining evidence over the fact that sufficient design and review of processes have taken place.</div>					
Business Benefits	Revenue is a critical component for the Thromdes. It has been observed that hacking activities may result in loss of revenue collection and disruption in business. Adherence to and compliance of security polices reduces the probability of risks. It helps ensure a process based approach to manage information security and provides guidance over 133 controls which can be used to build robust information security architecture.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	8	Define security policies for Thromdes	37,500.00	-	37,500.00	0.0375
Risk	<div><input type="checkbox"/><input type="checkbox"/>The initiative does not demand any core structural changes or</div>					

Business Process Re-engineering Report

Initiative	Define security policies for Thromdes
Assessment	amendments to existing decision making authority and hence has low risks. □ This being a process based framework, does not depend on procurement and operations of dependent initiatives but is a preliminary exercise to the commissioning phase of the overall IT transformation exercise, hence, risks to this initiative are minimum.
Technical aspect	Following are the key elements on this initiative: □ a) Establishing the ISMS. □ b) Maintain and Improve the ISMS □ c) Monitor and Review the ISMS. □ d) Implement and Operate the ISMS.
Timelines	Three months
Skill requirements	Resources with experience in Information Security Management Systems and certification in ISO 27001 Chief Information Security Officer (CISO) to be identified to manage and guide respective teams and take key decisions on policies.
Dependencies & Assumptions	Security policies are required to be defined and established as a whole-of-Government and customized for the respective Departments. Developing and socializing new policies will require significant process adjustments throughout the organization. Tools like GRC or open source tools like Verinice may help in automating the ISMS initiative.
Thromdes Expectations	Top management commitment to the ISMS initiative. Reviewing and providing approvals for the defined policies, process, procedures and management actions. Formalising the ISMS initiative and passing a mandate for inclusion of such practices.

4.9 Establish physical security for collection centers (CCTV)

Initiative	Establish physical security for collection centers (CCTV)			
Phase	Score	Rating	TT Rank	PT Rank
NA	6.64	Low	NA	3
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
3.8	0.9	0.5	1.0	0.5
Description of Initiative				
Overview	CCTV's are to be established in secured areas to ensure 24*7 monitoring of key assets.			
Objective	Monitoring of critical areas including collection centers.			
Rationale	Currently Thimphu Thromde has implemented CCTVs. These systems enable remote monitoring and also identify illegal activities including tampering, theft and other activities impacting operations and revenue collection.			

Business Process Re-engineering Report

Initiative	Establish physical security for collection centers (CCTV)					
Business Benefits	It helps ensure a process based approach to manage information security and provides guidance over 133 controls which can be used to build robust information security architecture.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	9	Establish physical security for collection centers (CCTV)	7,800.00	3,960.00	11,760.00	0.0118
Risk Assessment	Data storage and archival requires immense storage space in TB depending upon the resolution, compression and motion-detection modes. Policies (number of CCTV, locations, resolution, compression), storage types (SAN, NAS, Computer, Tape Libraries, VTLs), CCTV type (IP based or analogue) and view mode (Computer fixed, mobiles) are to be decided as they have an impact on the storage and hence the cost as well.					
Technical aspect	The components under consideration include: a) CCTV type (IP based or analogue) b) storage type (SAN, NAS, DVR, Tape Library) c) storage and archival time duration d) video management system with licenses (mobile, fixed computer viewing)					
Timelines	This is dependent on the number of CCTVs and the complexity of the building design. Tentatively 1 month is estimated for full scale implementation of 4 CCTVs.					
Skill requirements	Services to be procured from the CCTV manufacturer or partner in case of IP CTV with centralized hosting and distributed viewing capabilities.					
Dependencies & Assumptions	CCTV is assumed to be a requirement for key areas within Thromde premises which will include collection centers and server rooms.					
Thromdes Expectations	CCTV monitoring should be available for monitoring collection centers.					

4.10 Establish physical security for collection centers (Access Controls)

Initiative	Establish physical security for collection centers (Access Controls)			
Phase	Score	Rating	TT Rank	PT Rank
1	5.99	Low	1	4
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
3.1	0.9	0.5	1.0	0.5

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Initiative	Establish physical security for collection centers (Access Controls)					
Description of Initiative						
Overview	Access control systems can be implemented on doors to ensure only people with the required authorization can enter the zone. Collection centers are critical zone within a Thromde and hence entry should be limited to authorize personnel only. Access controls can be implemented through multiple devices with provisions for a) smart / proximity card based entry b) pin based entry c) biometric (finger print) entry This may also be extended for the local server rooms situated within a Thromde premise.					
Objective	Identify and implement access control device for collection centers to restrict access to authorized personnel only.					
Rationale	Security concerns for collection centers and server rooms are of utmost importance. Rationale for selection of the two rooms (collection centers and server rooms) is based on the assets in the rooms.					
Business Benefits	Security is required for collection centers and server rooms. Natural or accidental hazards will result in loss of revenue or citizen information.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	10	Establish physical security for collection centers (Access Controls)	4,000.00	2,100.00	6,100.00	0.0061
Risk Assessment	None					
Technical aspect	Choice of access controls is important based on the environmental conditions and commercials. IP based access controls require LAN connectivity and are preferred for large scale data centers with centralized management feature. Thromde may consider localized pin code based entry system.					
Timelines	1 week for each Thromde					
Skill requirements	To be implemented by the local equipment manufacturer or service provider.					
Dependencies & Assumptions	Non-IP based devices would consume power. In the event of power outage, trap door or over-rode feature should be available to prevent lock-out.					
Thromdes Expectations	None					

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4.11 Establish physical security for collection centers (Security Guards)

Initiative	Establish physical security for collection centers (Security Guards)					
Phase	Score	Rating	TT Rank	PT Rank		
NA	5.92	Low	4	4		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
3.1	1.0	0.3	1.0	0.5		
Description of Initiative						
Overview	Allow security guards to monitor Thromde infrastructure and premises.					
Objective	The objective is to have monitoring and surveillance with the help of security guards to protect and safeguard infrastructure and collection centers.					
Rationale	With the e-Governance plan, Thromde will have critical ICT infrastructure along with existing data on land records and citizens. It is important to have 24*7 surveillance and monitoring to prevent natural or accidental hazards.					
Business Benefits	Security is required for collection centers and server rooms. Natural or accidental hazards will result in loss of revenue or citizen information.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	11	Establish physical security for collection centers (Security Guards)	-	18,000.00	18,000.00	0.0180
Risk Assessment	None					
Technical aspect	Security guards may be considered for CCTV surveillance.					
Timelines	Not applicable					
Skill requirements	As per local policy					
Dependencies & Assumptions	None					
Thromdes Expectations	None					

4.12 Implement information security policies (ISO 27001)

Initiative	Implement information security policies (ISO 27001)				
Phase	Score	Rating	TT Rank	PT Rank	
3	7.01	Medium	4	3	

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Initiative		Implement information security policies (ISO 27001)				
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.3	1.0	0.3	1.0	0.4		
Description of Initiative						
Overview	<div><input type="checkbox"/>The ISO/IEC 27001:2013 Standard adopts a process approach for establishing, implementing, operating, monitoring, reviewing maintaining and improving an organization's Information Security Management System (ISMS).</div> <div><input type="checkbox"/>This initiative is proposed as a new management system for Thromdes, thereby, framing a process and risk based information security management system. Following are the key elements on this initiative:</div> <div><input type="checkbox"/>a) Establishing the ISMS.</div> <div><input type="checkbox"/>b) Maintain and Improve the ISMS</div> <div><input type="checkbox"/>c) Monitor and Review the ISMS.</div> <div><input type="checkbox"/>d) Implement and Operate the ISMS.</div>					
Objective	Ensure due awareness among Thromde officers Plan and address security concerns Establish a risk framework Define and implement standards and guidelines Ensure compliances to security guidelines and standards					
Rationale	<div><input type="checkbox"/>Scope of enforceable information security policies and procedures does not address all information security areas.</div> <div><input type="checkbox"/>Policy management processes (e.g., communications, exception management) are not completely documented, which reduces the clarity on obtaining evidence over the fact that sufficient design and review of processes have taken place.</div>					
Business Benefits	Revenue is a critical component for the Thromdes. It has been observed that hacking activities may result in loss of revenue collection and disruption in business. Adherence to and compliance of security polices reduces the probability of risks. It helps ensure a process based approach to manage information security and provides guidance over 133 controls which can be used to build robust information security architecture.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	12	Implement information security policies (ISO 27001)	75,000.00	-	75,000.00	0.0750
Risk Assessment	<div><input type="checkbox"/><input type="checkbox"/>The initiative does not demand any core structural changes or amendments to existing decision making authority and hence has low risks.</div> <div><input type="checkbox"/>This being a process based framework, does not depend on</div>					

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Initiative	Implement information security policies (ISO 27001)
	procurement and operations of dependent initiatives but is a preliminary exercise to the commissioning phase of the overall IT transformation exercise, hence, risks to this initiative are minimum.
Technical aspect	<p>Following are the key elements on this initiative:</p> <ul style="list-style-type: none"> <input type="checkbox"/> a) Establishing the ISMS. <input type="checkbox"/> b) Maintain and Improve the ISMS <input type="checkbox"/> c) Monitor and Review the ISMS. <input type="checkbox"/> d) Implement and Operate the ISMS.
Timelines	Three months
Skill requirements	<p>Resources with experience in Information Security Management Systems and certification in ISO 27001</p> <p>Chief Information Security Officer (CISO) to be identified to manage and guide respective teams and take key decisions on policies.</p>
Dependencies & Assumptions	Security policies are required to be defined and established as a whole-of-Government and customized for the respective Departments. Developing and socializing new policies will require significant process adjustments throughout the organization. Tools like GRC or open source tools like Verinice may help in automating the ISMS initiative.
Thromdes Expectations	<p>Top management commitment to the ISMS initiative.</p> <p>Reviewing and providing approvals for the defined policies, process, procedures and management actions.</p> <p>Formalising the ISMS initiative and passing a mandate for inclusion of such practices.</p>

4.13 Implement information security tools

Initiative	Implement information security tools			
Phase	Score	Rating	TT Rank	PT Rank
1	6.97	Medium	1	4
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
4.3	0.9	0.3	1.0	0.5
Description of Initiative				
Overview	Information security tools refer to solutions, devices or equipment which enforces security policies and mitigates risks to the ICT solutions and infrastructures.			
Objective	Implement security solutions to protect ICT solutions especially financial transactions related applications.			
Rationale	Cybercriminals typically targets financial institutions and revenue bodies to extract citizen information or with malicious intent. Security solutions like UTM's, Firewalls and IPS mitigates the risks and safeguarding data and revenue.			
Business Benefits	With business and Government services getting digitized and transformation of processes to online services requires safeguarding			

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Initiative	Implement information security tools					
	of the online presence and ICT solutions as the probability of hacking related activities increases,					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	Total in USD Million
	13	Implement information security tools	41,666.67	18,750.00	60,416.67	0.0604
Risk Assessment	Security solutions require considerable investments and with technology refresh period gradually decreasing it is necessary to have a detailed assessment prior to selection of solutions.					
Technical aspect	MoIC has provided UTM appliances for the Thromdes, It is proposed that the UTM solutions should be implemented and hosted from a centralized location like the National Data Center.					
Timelines	As per MoIC directives					
Skill requirements	OEM or Service Partner services required for implementation and handholding. At least two technical programmer support associates required for managing the utm appliances.					
Dependencies & Assumptions	MoIC to provide the required support and handholding. Patches and latest updates to be provisioned with three years of support and updates.					
Thromdes Expectations	Implement UTM appliance provided by MoIC to secure ICT solutions and review for further security solutions if applicable like next generation firewalls.					

4.14 Implement two factor authentication for critical applications

Initiative	Implement two factor authentication for critical applications			
Phase	Score	Rating	TT Rank	PT Rank
3	7.17	Medium	4	3
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
4.3	0.9	0.5	1.0	0.5
Description of Initiative				
Overview	Two factor authentication typically involves two simultaneous steps to validate a user. It includes a password and biometric authentication to validate a peron. This is proposed for providing access to critical applications and for senior management.			
Objective	Validate a user role prior to providing access to Thromde solution			
Rationale	Billing and collection centers are critical software modules. All users should have access to these solutions. Two factor authentication system ensures only people with the appropriate permissions should have access to the system			

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Initiative	Implement two factor authentication for critical applications					
Business Benefits	Safety and security of key revenue modules is ensured.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	14	Implement two factor authentication for critical applications	2,500.00	2,450.00	4,950.00	0.0050
Risk Assessment	None					
Technical aspect	<p>Two factor authentication systems have two components:</p> <p>a) level 1 - user id and password</p> <p>b) level 2 – biometric scan</p> <p>A biometric scanner is required with options to store upto 5 biometric scans of registered users with one active user. The revenue module login should be integrated with the two factor authentication.</p>					
Timelines	1 month					
Skill requirements	1 developer with OEM or service partner support					
Dependencies & Assumptions	Two factor authentication is intended for the collection centers and senior management.					
Thromdes Expectations	None					

4.15 Implement periodic security audits

Initiative	Implement periodic security audits			
Phase	Score	Rating	TT Rank	PT Rank
3	6.70	Medium	3	2
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
4.6	0.9	0.1	0.6	0.5
Description of Initiative				
Overview	Security audits are undertaken by organizations to assess the security position of the ICT systems in place.			
Objective	Periodic security audit of the existing ICT systems			
Rationale	<p>Protection of the existing ICT systems</p> <p>Identification of threats and vulnerabilities for the existing ICT systems</p>			
Business Benefits	The increase of security at the technical level by the detection of vulnerabilities around the infrastructure thereby helping in enhancing the security at the organizational level. As threats to systems,			

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Initiative	Implement periodic security audits					
	applications and networks continue to become more sophisticated, it is vital to keep ahead of any would-be attackers with advanced vulnerability assessments by a managed service provider who keeps abreast of potential threats.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	Total in USD Million
	15	Implement quarterly security audits	1,00,000.00	-	1,00,000.00	0.1000
Risk Assessment	The initiative does not demand any core structural changes or amendments to existing decision making authority and hence has low risks. The increase of security at the technical level by the detection of vulnerabilities around the infrastructure thereby helping in enhancing the security at the organizational level.					
Technical aspect	<p>This initiative focuses on delivering professional security services specifically security assessment by the support of firms in the service industry for managed security service providers, hence, an outsourced option. Training requirements typically focused around information security awareness and training levels which are specifically around the security management system and these details are available in the initiative for ISO 27001.</p> <p>This section illustrates the scope for each of the activities and are described below:</p> <p>Activity 1 – Vulnerability Assessment & Secure Configuration Review of Internal Infrastructure</p> <p>a) Vulnerability Assessment Identify potential exposures against attacks that could originate from malicious intents connected to the Internet. This activity will be based on compromising the vulnerabilities assessed during the initial scanning of the penetration testing exercise. It will be focused over internet facing assets (including applications) as part of the scope for assessment.</p> <p>b) Secure configuration review: This would cover reviewing the security configuration parameters of the Web facing IT infrastructure.</p> <p>Activity 2 –Penetrating Testing for Public facing infrastructure</p> <p>Activity 1 - Database Security Assessment Databases contain business critical information such as customer</p>					

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Initiative	Implement periodic security audits
	<p>names, company account information, etc. Databases are complex pieces of software with vulnerabilities which can be exploited by criminals who are determined to access critical business information. A Database vulnerability assessment will provide a customized, extensive, impartial, and periodic Security analysis for Thromde's database applications and servers. This will evaluate current security standards and levels of compliance to give Thromdes a well-developed matrix of existing threats, database application vulnerabilities, and real-world recommendations to address specific weaknesses.</p> <p>Activity 2 - Wireless Security assessment The WLAN vulnerability assessment will help Thromde in knowing what their wireless network looks like to the outside world on the Internet. It will help in determining if there is an easy way in to Thromde's network which may be exploited by hackers, Is it possible for unauthorized devices to attach themselves to Thromde's network.</p>
Timelines	1 month per audit
Skill requirements	<p>For Project Manager and Governance - Chief Information Security Officer.</p> <p>For Security Assessment Operations: Application Security Subject Matter Expert. Vulnerability assessment and Penetration testing Subject Matter Expert. Secure Configuration Review Subject Matter Expert. Certified Ethical Hackers.</p>
Dependencies & Assumptions	<p>This is linked to ISMS and ISO 27001 implementation</p> <p>The overall IT strategy initiative, Network and Infrastructure strategy in particular.</p>
Thromdes Expectations	Secured and reliable ICT systems with reduced risk impact

4.16 Implement SMS based notification systems

Initiative	Implement SMS based notification systems			
Phase	Score	Rating	TT Rank	PT Rank
1	7.50	Medium	1	1
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
4.6	0.9	0.5	1.0	0.5
Description of Initiative				
Overview	Mobile penetration in Bhutan is fairly well and is a priority for the Thromdes to establish sms based notifications for the taxes, fees and other charges to alert citizens.			
Objective	Introduce sms based notifications for citizens			
Rationale	Paper based bills require time for circulation and also require efforts of Thromde officers for billing including paper and other resources.			

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Initiative	Implement SMS based notification systems					
	SMS can be implemented as an alternative to paper based bills will save time and money for the Thromdes.					
Business Benefits	Effort and time required to circulate paper based bills will be reduced					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	16	Implement sms based notification systems	8,500.00	6,300.00	14,800.00	0.0148
Risk Assessment	<p>Citizen database is a priority here wherein incorrect mapping of mobile numbers will result in incorrect issuance of bill related information.</p> <p>Cost of sms gateway services is to be negotiated with the service providers to ensure a discounted rate for issuance of bulk sms else the cost factor applicable per sms may prevent the initiation of sms notifications.</p>					
Technical aspect	<p>The steps involved are:</p> <p>a) establish citizen information database with mobile details along with citizen validation and update of citizen information database</p> <p>b) integrate billing entities to send a complete view of billing or issue separate sms for each fee / taxes / charges</p> <p>c) integrate with a sms gateway service provider</p> <p>d) develop scheduler to issue sms on billing information to citizens as per billing cycle</p>					
Timelines	2 months dependant on the availability of sms gateway service provider					
Skill requirements	<p>1 developer required for sms gateway integration and update of citizen information database (for mobile numbers)</p> <p>Data entry operators for citizen information update</p>					
Dependencies & Assumptions	<p>Availability of citizen information database with mobile numbers</p> <p>Availability of sms gateway service provider</p>					
Thromdes Expectations	Implement sms notifications as an alternative to paper based notifications. Citizens to be given options to present their preferences.					

4.17 Implement email-based notification systems

Initiative	Implement email-based notification systems			
Phase	Score	Rating	TT Rank	PT Rank
1	7.50	Medium	1	4
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
4.6	0.9	0.5	1.0	0.5

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Initiative	Implement email-based notification systems					
Description of Initiative						
Overview	Availability of email ids amongst citizens is yet to penetrate to the degree expected in comparison to mobiles. However, looking at the future and the cost perspectives compared to SMS email is a preferred option in terms of cost.					
Objective	Introduce email based notifications for citizens					
Rationale	Paper based bills require time for circulation and also require efforts of Thromde officers for billing including paper and other resources. Emails can be implemented as an alternative to SMS and paper based bills will save time and money for the Thromdes.					
Business Benefits	Effort and time required to circulate paper based bills will be reduced					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	17	Implement email-based notification systems	9,333.33	5,000.00	14,333.33	0.0143
Risk Assessment	Citizen database is a priority here wherein incorrect mapping of email ids will result in incorrect issuance of bill related information.					
Technical aspect	The steps involved are: a) establish citizen information database with email details along with citizen validation and update of citizen information database b) integrate billing entities to send a complete view of billing or issue separate emails for each fee / taxes / charges c) integrate with a email gateway d) develop scheduler to issue emails on billing information to citizens as per billing cycle					
Timelines	2 months					
Skill requirements	1 developer required for email gateway integration and update of citizen information database (for email ids) Data entry operators for citizen information update					
Dependencies & Assumptions	Availability of citizen information database with email ids.					
Thromdes Expectations	Implement email notifications as an alternative to SMS and paper based notifications. Citizens to be given options to present their preferences.					

4.18 Augment billing team staff

Initiative	Augment billing team staff			
Phase	Score	Rating	TT Rank	PT Rank
NA	6.38	Low	NA	3

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Initiative	Augment billing team staff			
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
3.9	1.0	0.1	1.0	0.4
Description of Initiative				
Overview	Not applicable			
Objective	Not applicable			
Rationale	Not applicable			
Business Benefits	Not applicable			
Cost Analysis	Not applicable			
Risk Assessment	Not applicable			
Technical aspect	Not applicable			
Timelines	Not applicable			
Skill requirements	Not applicable			
Dependencies & Assumptions	Not applicable			
Thromdes Expectations	<p>The initiative has been rejected by Thrimphu Thromde taking into consideration the work requirements and introduction of new systems.</p> <p>Phuentsholing Thromde intends to review the implementation of existing ICT systems and then take a view on the implementation perspectives.</p>			

4.19 Augment Urban Planning Division team staff

Initiative	Augment Urban Planning Division team staff			
Phase	Score	Rating	TT Rank	PT Rank
NA	5.84	Low	2	4
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
3.3	1.0	0.1	1.0	0.4
Description of Initiative				
Overview	Not applicable			
Objective	Not applicable			
Rationale	Not applicable			
Business Benefits	Not applicable			
Cost Analysis	Not applicable			

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Initiative	Augment Urban Planning Division team staff
Risk Assessment	Not applicable
Technical aspect	Not applicable
Timelines	Not applicable
Skill requirements	Not applicable
Dependencies & Assumptions	Not applicable
Thromdes Expectations	The initiative is intended to be an internal decision for both Thromdes and the senior management will be considering the same based on recommendations and future requirements.

4.20 Data quality improvements and quality check

2.20 Data quality improvements and quality check						
Initiative		Data quality improvements and quality check				
Phase	Score	Rating	TT Rank	PT Rank		
1	8.20	High	1	1		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
6.0	0.9	0.3	0.6	0.4		
Description of Initiative						
Overview	With the introduction of ICT systems, data availability and quality is a key concern, Data should be available and should be useable and validated. Thromdes are currently undergoing exercises on data quality improvement which will in turn ensure availability of accurate data.					
Objective	Improve quality of data available with Thromdes					
Rationale	Without quality data availability, an ICT system does not function. Thromdes are investing in ICT systems so it is important to update the data quality to derive value from the ICT systems investment.					
Business Benefits	Accurate reporting will be available for Thromde management to take informed and better business decisions.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+ Total in USD Million
	20	Data quality improvements and quality check	-	20,000.00	20,000.00	0.0200
Risk Assessment	Assessment of the data quality is to be reviewed and validated.					
Technical aspect	Data entry operators required for digitization of data. Thromde officers should be assigned responsibility to validate the					

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Initiative	Data quality improvements and quality check
	data entered in the systems as a control measure.
Timelines	Estimated time period of one year considering the inclusion of other related activities like: a) citizen information update – email, sms and billing preferences b) module based data information c) validation of data entered in the system d) stabilization period
Skill requirements	Data entry operators Officers to validate data digitization process Developer to develop scripts for data quality check and controls
Dependencies & Assumptions	Data quality measurement KPIs to be identified and automated to check for data quality.
Thromdes Expectations	None

4.21 UPS based systems and power backup (for collection centers)

Initiative	UPS based systems and power backup (for collection centers)					
Phase	Score	Rating	TT Rank	PT Rank		
NA	6.34	Low	NA	1		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
3.3	1.0	0.5	1.0	0.5		
Description of Initiative						
Overview	Uninterrupted Power Supply (UPS) provides emergency power to computer systems in the event of power outage. This prevents shutdown of the computers. The officers will be able to save their work and shutdown their computer systems.					
Objective	Implement UPS and power backup for collection center computers					
Rationale	It has been discussed that the collection center officers are facing challenges during power outages. While feeding data in the systems, in the event of an power outage, the data which is being entered is lost as the computer shuts down. The current system provides users the functionality to feed all data before saving ad submitting. Hence without an UPS, the interim data fed into the system is lost and the user needs to enter data from the first again.					
Business Benefits	Time and efforts of the officer will be reduced					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+ Total in USD Million
	21	UPS based systems and power backup	1,000.00	450.00	1,450.00	0.0015

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Initiative	UPS based systems and power backup (for collection centers)					
		(for collection centers)				
Risk Assessment	None					
Technical aspect	2 UPS device to be implemented for each of the four Thromdes					
Timelines	1 day post procurement of the device					
Skill requirements	Not applicable					
Dependencies & Assumptions	Not applicable					
Thromdes Expectations	UPS is being provisioned in Thimphu Thromdes. Phuentsholing Thromdes is interested in procuring UPS for critical terminals including billing and collection computers.					

4.22 UPS based systems and power backup (for other systems)

Initiative	UPS based systems and power backup (for other systems)					
Phase	Score	Rating	TT Rank	PT Rank		
NA	5.60	Low	NA	NA		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
2.8	1.0	0.3	1.0	0.5		
Description of Initiative						
Overview	Uninterrupted Power Supply (UPS) provides emergency power to computer systems in the event of power outage. This prevents shutdown of the computers. The officers will be able to save their work and shutdown their computer systems.					
Objective	Implement UPS and power backup (for other systems)					
Rationale	Due to power outages, users lose their work as they are unable to save their intermediate work. UPS would enable the users to save their work and in-turn help reduce the redundancy and loss of information.					
Business Benefits	Time and efforts of the officer will be reduced					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	22	UPS based systems and power backup	12,500.00	5,625.00	18,125.00	0.0181
Risk Assessment	None					

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Initiative	UPS based systems and power backup (for other systems)
Technical aspect	25 UPS device to be implemented for each of the four Thromdes Going forward, if data center and DR site is not identified and the Thromdes choose to go ahead with their own localized server rooms, it is proposed that DG sets be introduced to ensure power backup for the critical server rooms.
Timelines	1 day post procurement of the device
Skill requirements	Not applicable
Dependencies & Assumptions	Not applicable
Thromdes Expectations	Not applicable

4.23 Non-functioning meter tracking system module

4.25 Non-functioning meter tracking system module						
Initiative		Non-functioning meter tracking system module				
Phase	Score	Rating	TT Rank	PT Rank		
2	6.42	Low	1	2		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
3.6	0.9	0.5	1.0	0.5		
Description of Initiative						
Overview	As per the rules, a non-functioning meter is to be replaced within three months from the reported date of non-functioning. However, the rule is not enforced due to limited information available with Thromde officers. For non-functioning meters, as per the rules average of last three months meter reading is taken. A non-functioning meter tracking module is proposed to assist Thromde officers to identify and track non-functioning meters.					
Objective	Assist Thromde to identify, track and replace non-functioning water meter readers.					
Rationale	Compliance to rules					
Business Benefits	Ensuring loss on account of non-functioning meter readers is reduced.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	Total in USD Million
	23	Non-functioning meter tracking system module	2,000.00	-	2,000.00	0.0020
Risk Assessment	The existing process of meter replacement is dependent on the information shared by the meter readers. The meter readers are an important stakeholder to ensure compliance to the rule for replacing					

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Initiative	Non-functioning meter tracking system module
	meters. The system may be able to identify trends based on which recommendations can be provided to Thromde for replacing meter readers. However manual intervention would be required to verify and replace.
Technical aspect	<p>The module should cover the following functionalities:</p> <p>a) the module should have an interface should allow users to enter meter numbers which are non-functioning</p> <p>b) the module should be integrated with the existing meter reading module</p> <p>c) the module should be able to read through meter reading data (current and historical) to identify meter readers which have same readings for the last three instances.</p> <p>d) the module should generate a list of meters to be replaced with information on the delays, non-functioning timelines and option to assign the replacement to a meter reading officer.</p>
Timelines	2 months
Skill requirements	2 developers
Dependencies & Assumptions	Meter readers would be required to validate the meters identified by the module and also report meters which are not functioning.
Thromdes Expectations	Track and identify meters which are not functioning.

4.24 Introduce handheld / AMR devices for meter readers

Initiative	Introduce handheld / AMR devices for meter readers			
Phase	Score	Rating	TT Rank	PT Rank
1	8.29	High	1	3
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
6.4	0.7	0.1	0.6	0.5
Description of Initiative				
Overview	<p>The meter reading cycle for water billing requires a complete month. Collecting meter readings and distribution of forms take up bulk of the time in this cycle. Moreover, as per discussion with the Thromde teams, it has been observed that due to manual interventions in recording meter readings and data entry, errors have cropped up.</p> <p>It is proposed that handheld / AMR devices are to be implemented to assist the meter readers in the meter readings.</p>			
Objective	Provide handheld / AMR devices to meter readers to collect meter readings			
Rationale	Provision of meter reading devices (or handheld devices) will help Thromdes to reduce time lines and reduce errors in recording data.			
Business Benefits	Errors in meter readings impacts revenue for the Thromdes. Provision of meter readers will help reduce the manual errors in			

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Initiative	Introduce handheld / AMR devices for meter readers					
	meter readings.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	24	Introduce handheld devices for meter readers	90,666.67	9,250.00	99,916.67	0.0999
Risk Assessment	Meter readers would be unfamiliar with AMR / handheld devices. Due change management program to be identified and planned for. Devices would be of considerable value and it is required to protect them from accidental damages.					
Technical aspect	<p>For AMRs:</p> <p>a) the device should be capable of retrieving data from the meters and mapping the readings to the meter numbers</p> <p>b) the device should have feature to submit meter data to the RMS along with online / offline sync</p> <p>For handheld devices:</p> <p>a) the system should provide an interface for the meter readers to enter meter readings</p> <p>b) the system should be capable of calculating the water bills</p> <p>c) system should be integrated with a mobile printer to enable meter readers to generate on-spot bills</p> <p>d) the system should have online / offline mode to sync meter reading data with RMS</p>					
Timelines	Complete roll-out would require change management, training and handholding period including pilot run. Overall system development and rollout timeline estimated to be tentatively 6 months.					
Skill requirements	2 developers and 4 handholding staff for each Thromde					
Dependencies & Assumptions	Active participation of meter readers required for this initiative					
Thromdes Expectations	Reduction of billing time and reduced errors					

4.25 Implement document management system

Initiative	Implement document management system			
Phase	Score	Rating	TT Rank	PT Rank
1	6.76	Medium	1	1
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
4.1	0.9	0.3	1.0	0.5

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Initiative	Implement document management system					
Description of Initiative						
Overview	Document management systems allow organizations to store and retrieve records. Currently Thromdes have physical paper based file management system which is difficult to manage and searching requires time. Through document management systems, it is envisaged that the governance and operations would be streamlined and result in reduced efforts of the officers to track records.					
Objective	Implement document management systems and digitize physical records					
Rationale	Streamline and standardize records management and storage process					
Business Benefits	Information would be readily available to officers thereby enabling faster decision process.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	25	Implement document management system	57,500.00	31,350.00	88,850.00	0.0889
Risk Assessment	Historical data is required to be uploaded in the document management system along with the current documents to establish a linkage of the records where applicable.					
Technical aspect	The key activities include: a) identify documents to be scanned and stored in DMS b) identify soft copy available within systems which are to be checked in a DMS c) define meta data to be captured for all document categories d) integration with RMS and other software modules to allow documents to be checked in e) link system with scanners and OCR / OMR devices where applicable f) identify indexing mechanisms (meta data or document contents) g) define storage and archival policies for different categories of documents h) identify document retrieval scenarios and interfaces / services to be provided i) define security and access control policies					
Timelines	As per discussion with the Thromdes, approximately one year is estimated to digitize physical copies of documents and implement DMS					
Skill requirements	Data entry operators and 2 developers estimated					
Dependencies & Assumptions	Digitization of existing physical copies is a mandatory requirement					

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Initiative	Implement document management system
Thromdes Expectations	Improve the current process of storage and retrieval of records.

4.26 Implement MIS reporting for tracking and monitoring

126 Implement MIS reporting for tracking and monitoring						
Initiative		Implement MIS reporting for tracking and monitoring				
Phase	Score	Rating	TT Rank	PT Rank		
2	8.33	High	2	2		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
6.0	0.8	0.5	0.6	0.4		
Description of Initiative						
Overview	MIS reports are intended for middle and senior levels of management within Thromdes. Data is typically used from the underlying transactional databases (like RMS) to present information on performances, delays, defaults, revenue collection and other information requirements.					
Objective	Provide structured reports to management to track and improve operations and performance					
Rationale	Information is required by management to take decisions and understand the current state of affairs. Delay in retrieving information will result in delay in decisions.					
Business Benefits	Tax defaults and poor revenue collection would be tracked and management would be able to take decisions based on the information provided in MIS reports.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	26	Implement MIS reporting for tracking and monitoring	9,000.00	-	9,000.00	0.0090
Risk Assessment	Data quality checks to be undertaken else an MIS report will not add value to management.					
Technical aspect	Thromdes have currently identified key reports which are to be developed as per management requirements and are in the process of developing the reports. Going forward, Thromdes may consider implementing additional systems like: a) dashboards b) decision support systems c) root cause analysis d) forecasting					
Timelines	The initiative timelines are dependent of the number and complexity of the reports and availability of data					

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Initiative	Implement MIS reporting for tracking and monitoring
Skill requirements	At least 3 developers
Dependencies & Assumptions	Data digitization Data quality control
Thromdes Expectations	Establish systems to provide reports which would reduce human efforts & intervention and also assist Thromde management to take important decisions.

4.27 Implement Business Intelligence tools

Initiative	Implement Business Intelligence tools			
Phase	Score	Rating	TT Rank	PT Rank
NA	7.63	Medium	4	Not discussed
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
6.0	0.6	0.1	0.6	0.3
Description of Initiative				
Overview	<p>BI tools are used in an organization as an enabler for making business decisions based on assessment of current and historical data. Statistical tools and data models are used to evaluate performances and identify root causes for the current state performance. They are used to analyse, describe and assist in identifying areas of improvement in performance.</p> <p>Some of the common applications of BI tools include:</p> <ul style="list-style-type: none"> a) reporting b) analytics c) data mining d) performance management e) benchmarking f) predictive and prescriptive analysis <p>Various local and state Government bodies are using BI solutions (on premise and cloud) for reporting, budget, forecasting, benchmarking and evaluating project performances.</p>			
Objective	Implement BI tool to identify revenue leakage areas and optimize Thromde performances.			
Rationale	<p>Going forward, as Thromdes continue to focus on providing better citizen services and improve revenue base, some of the key areas to be considered would include:</p> <ul style="list-style-type: none"> a) reporting (across thromdes, across projects / divisions, across regions, across tax components) b) evaluating performances c) planning and tracking projects d) budgeting and forecasting <p>With increasing volumes of data on citizen and projects, Thromdes are</p>			

Business Process Re-engineering Report

Initiative	Implement Business Intelligence tools					
	leveraging ICT tools to manage activities. As per leading practices, it is envisaged that Thromdes may consider reviewing the use of analytics to further improve performance and increase revenue leakage.					
Business Benefits	BI tools act as an enabler to identify areas of improvement in performances, reporting and revenue base.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	27	Implement Business Intelligence tools	2,20,000.00	1,05,000.00	3,25,000.00	0.3250
Risk Assessment	BI tools are used to analyse data (operational, internal and external, current and historical) to assist organizations to analyse events. These activities require availability of data. Currently Thromdes are initiating data digitization and standardization activities. It is proposed that the BI solution, if required, may be considered after 3 -5 years post stabilization of the existing ICT systems.					
Technical aspect	<p>BI tool requires historical and current data available and network of interconnected systems. Typically BI / DW is considered wherein the data warehouse is leveraged to aggregate data and split it in data marts as per sectors, Government bodies, regions and functions.</p> <p>BI implementation timeline cannot be undertaken with a big-bang approach. Phase-wise approach is proposed to be considered with priority based selected systems being interconnected with the central data warehouse system. Options to be considered for pilot implementation may include either a region or a government body or a project.</p> <p>Selection of a BI tool requires consideration of multiple parameters including:</p> <ul style="list-style-type: none"> a) total cost of ownership b) availability of skilled manpower and expertise c) data volumes d) architecture and core features e) integration (with data warehouse, ETL and portals) f) open source against COTS comparison 					
Timelines	Typical lifecycle planning for a BI tool is 7 – 10 years considering the phase-wise approach.					
Skill requirements	BI tool implementation requires availability of key experts in this field.					
Dependencies &	Availability of historical data and current transactional data, key experts for the selected technology (BI, DW and ETL) and senior leadership					

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Initiative	Implement Business Intelligence tools
Assumptions	buy-in.
Thromdes Expectations	None

4.28 Integration with e-Sakor systems

12.6 Integration with e-Sakor systems						
Initiative	Integration with e-Sakor systems					
Phase	Score	Rating	TT Rank	PT Rank		
2	6.56	Low	2	3		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.1	0.9	0.5	0.6	0.5		
Description of Initiative						
Overview	National Land Commission (NLC) is the apex body for land administration, management, surveying and mapping. NLC is in the process of digitizing land records for Bhutan based on ESRI ArcGIS. Also Thromdes are required to share data with NLC through the e-Sakor systems for land records.					
Objective	Integration of Thromde systems with e-Sakor					
Rationale	Currently the Thromde officers are required to enter data manually in the e-Sakor systems. The data entered exists within Thromde systems which is being cross-checked for entering.					
Business Benefits	System level integration will in-turn help optimize efforts of the officers and reduce errors.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	+ Total in USD Million
	28	Integration with e-Sakor systems	1,500.00	-	1,500.00	0.0015
Risk Assessment	None					
Technical aspect	<p>Database schema is required to be reviewed and re-designed, if required to align with e-Sakor systems. Data quality checks are also to be considered for the same.</p> <p>Integration may be considered by one of the mechanisms:</p> <p>a) Push – Thromde systems to push data into e-Sakor systems in XML format (preferable). For this, e-Sakor systems are required to expose a service which will be taking care of data quality checks and validations as per their database requirements.</p> <p>b) Pull – NLC to pull data from Thromde database. Thromde to share</p>					

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Initiative	Integration with e-Sakor systems
	appropriate credentials (user logins)
Timelines	This is dependent on the selection of the appropriate technical implementation approach selected and technical manpower available with NLC and Thromdes.
Skill requirements	1 – 2 developer(s) with service and database experience.
Dependencies & Assumptions	Senior management buy-in required to go ahead with integration.
Thromdes Expectations	Reduce or eliminate redundant activities involved.

4.29 Introduce ESRI ArcGIS server editions

Initiative	Introduce ESRI ArcGIS server editions for implementation			
Phase	Score	Rating	TT Rank	PT Rank
2	7.51	Medium	2	3
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
5.3	0.7	0.1	1.0	0.4
Description of Initiative				
Overview	<p>A Geographic Information System (GIS) is a computer system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data. GIS applications are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data in maps, and present the results of all these operations.</p> <p>NLC and Thromde are using ESRI ArcGIS solution which is available as:</p> <ul style="list-style-type: none"> a) cloud hosted solution b) server c) desktop editions. <p>Thimphu Thromde has a dedicated two member GIS team which is leveraging ESRI ArcGIS desktop licenses.</p>			
Objective	Implement ArcGIS server based solution			
Rationale	<p>Desktop based GIS solutions have limited usage as the data is available locally in a single desktop. Since Thimphu Thromde GIS team consists of two members, the GIS based information is available locally in the two desktops. This in turn creates two disparate sources of truth. For a nation, GIS data is required to have a single source of truth with different layers like satellite imagery, forest, road, communication layers which in turn are leveraged by different ministries and departments.</p>			

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Initiative	Introduce ESRI ArcGIS server editions for implementation					
	<p>Some of the GIS software organizations include:</p> <ul style="list-style-type: none"> a) ESRI ArcGIS b) Bentley Systems c) Intergraph d) Smallworld e) Pitney Bowes MapInfo <p>ESRI ArcGIS has been considered post discussion with senior management as NLC has been using the same solution and has also provided licenses to Thomde. A different solution will require efforts in terms of change management.</p>					
Business Benefits	<p>Server based GIS solutions in turn will allow Thomdes to have a single source of truth and percolate information across all divisions and sections thereby creating boundary less flow of information. This in turn will help in improving reporting and management of ground level operations and management.</p>					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex Opex) (USD)	Total in USD Million
	29	Introduce ESRI ArcGIS server editions for implementation	3,29,000.00	1,89,000.00	5,18,000.00	0.5180
Risk Assessment	<p>GIS investment demands expert resources, updated satellite imagery and survey data to enable decision making. Data and map layers are key resources to enable due usage of GIS platform for decision making.</p>					
Technical aspect	<p>There are two approaches proposed for implementing GIS server solutions:</p> <ul style="list-style-type: none"> a) Establishing a centralized GIS platform (server edition) – All government organizations may leverage the platform by adding their respective map layers on top of the base layer (satellite image or digitized survey map). Since NLC has implemented ArcGIS 					
Timelines	<p>The key requirement for using GIS platforms is the availability of spatial data and map layers. Map layers require considerable survey and digitization of data. As per discussions with GIS and management team, the GIS initiative is required to be considered as a long term initiative (3 – 5 years) to leverage the benefit of the solution.</p>					

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Initiative	Introduce ESRI ArcGIS server editions for implementation
Skill requirements	Experienced GIS resources required for using and training the Thromde staff.
Dependencies & Assumptions	Availability of web map services from NLC and map layers
Thromdes Expectations	None

4.30 Implement work flow and scheduler-based systems

Initiative	Implement work flow and scheduler based systems					
Phase	Score		Rating	TT Rank	PT Rank	
NA	6.61		Low	NA	4	
Benefit quotient	Execution quotient		Cost quotient	Risk quotient	Time quotient	
3.9	0.7		0.5	1.0	0.5	
Description of Initiative						
Overview	<p>Work flow systems enable an organization to setup and monitor a sequence of activities to be undertaken to achieve a defined outcome. The sequence of activities is arranged as workflows. WS-BPEL 2.0 is one of the international standards for workflow management systems.</p> <p>Schedulers are used in office environment to distribute and allocate tasks from a list. Schedulers enable management to assess and identify available resources to execute activities.</p> <p>Based on discussions with the division and section management team, it has been identified that workflow management systems and schedulers would assist in the day-to-day operations of Thromde officers. Thromdes are in the process of implementing RMS which has the workflow and scheduling solutions as per discussion with the IT team management. Post-implementation, the functionality of the systems is required to be further reviewed to identify areas of improvement or introduction of new functionality to cater to monitoring and scheduling.</p>					
Objective	Improve monitoring and distribution of tasks for Thromde management within team members through ICT interventions.					
Rationale	Considering the number of citizen centric services delivered by the Thromdes and the volume of transactions, it is necessary to introduce ICT tools to assist management to monitor pending tasks and improve citizen service delivery performances of the Thromdes.					
Business Benefits	Management efforts in distribution, monitoring and ensuring citizen service delivery will improve through these ICT interventions.					
Cost Analysis	Id	INITIATIVE	Capex Total	Opex Total	Total (Capex	Total in

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Initiative	Implement work flow and scheduler based systems					
			(USD)	(USD)	+ Opex) (USD)	USD Million
	30	Implement work flow and scheduler based systems	1,000.00	-	1,000.00	0.0010
Risk Assessment	Any changes in the workflow will impact the system. This is turn will have an impact on the users if due change management sessions are not conducted. Frequent change requests in the workflow will impact system stability and also require additional efforts considering that a configurable workflow system based framework has not been implemented.					
Technical aspect	<p>The following steps are proposed for workflow and scheduler based systems:</p> <p>a) implement RMS in live environment</p> <p>b) allow a stabilization period to enable users to use the system</p> <p>c) identify if changes are required in the workflow or scheduling is to be introduced</p> <p>d) draft the requirements for a change request order</p>					
Timelines	Timelines would be dependent on the volume of changes identified by the users. For minor workflow changes a timeline of 2 months has been considered for cost assessment post discussion with Thromde IT team.					
Skill requirements	1 developer with experience in the existing RMS system workflow is considered.					
Dependencies & Assumptions	It is assumed that the workflows would remain constant and not require frequent changes. Workflows should be mapped to the roles and not the physical users themselves.					
Thromdes Expectations	None.					

4.31 Trained manpower for GIS systems

Initiative	Trained manpower for GIS systems			
Phase	Score	Rating	TT Rank	PT Rank
2	6.91	Medium	1	3
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
4.3	1.0	0.1	1.0	0.5
Description of Initiative				
Overview	Thromdes are planning to introduce GIS solutions to manage the spatial data and implement GIS based management and monitoring systems. GIS solutions implementation, management and operations would require expertise in the area.			
Objective	Augmenting GIS team to support the Thromde GIS solution			

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Initiative	Trained manpower for GIS systems					
Rationale	Currently Thimphu Thromde has a two member GIS team and Phuentsholing does not have any team. Once GIS solution is introduced, Thromdes would require GIS teams to manage the solution, digitize existing physical records. Post discussion with Thromde management, it is proposed that an in-house GIS team is the preferred option.					
Business Benefits	In-house GIS team will ensure return on the investments incurred in the implementation of GIS solution else the operations are required to be outsourced to a GIS service provider.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	31	Trained manpower for GIS systems	-	1,08,000.00	1,08,000.00	0.1080
Risk Assessment	GIS requires trained manpower and spatial data. Satellite imagery also is required to be updated periodically which is of considerable investment. In order to leverage the GIS solution as per Thromde requirements, trained GIS manpower would be required.					
Technical aspect	None					
Timelines	Not Applicable					
Skill requirements	GIS certified manpower or with due experience of GIS implementation and layer creation for at least 3 – 5 years.					
Dependencies & Assumptions	None					
Thromdes Expectations	None					

4.32 Identify data center for co-location of servers and storage

Initiative	Identify data center for colocation of servers and storage			
Phase	Score	Rating	TT Rank	PT Rank
2	7.88	High	3	2
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
5.3	1.0	0.1	1.0	0.5
Description of Initiative				
Overview	<p>A Data Center (DC) is a secured facility for hosting servers and storage infrastructure along with network connectivity. A DC comprises of the following layers:</p> <p>Layer 1 – Facility or Physical Infrastructure</p> <p>Layer 2 – IT Infrastructure</p> <p>Layer 3 – IT Services</p>			

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Initiative	Identify data center for colocation of servers and storage					
Objective	Identify DC for Thromdes to collocate servers and host IT solutions					
Rationale	<p>Thromde IT Infrastructure is currently being hosted in the local server rooms. The server rooms demands basic infrastructure like:</p> <p>Fire rated partitioning and doors</p> <p>False ceiling and raised floors</p> <p>Dedicated electrical power distribution system with UPS and DG set</p> <p>HVAC</p> <p>Management systems – Fire systems, surveillance, access controls, water leakage and rodent repellent</p> <p>Such features are currently not available in the server rooms. It is proposed that a centralized DC be identified for hosting the centralized infrastructure.</p>					
Business Benefits	A centralized DC ensures optimized usage of resources (electricity, HVAC, IT infrastructure).					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	32	Identify data center for colocation of servers and storage	-	90,000.00	90,000.00	0.0900
Risk Assessment	Colocation of IT infrastructure in a DC will demand quality network connectivity between the Thromde Offices and DC. Moreover, DC is required to be of Tier III standards to ensure availability and reliability of services.					
Technical aspect	Rack space is to be provisioned to Thromdes along with services to manage the server and storage infrastructure.					
Timelines	Once the DC is up and running and rack space is provided to Thromdes, it is estimated that within 1 month the server infrastructure of the Thromdes may be collocated and commissioned.					
Skill requirements	Infrastructure domain expert with configuration skills is required for the migration.					
Dependencies & Assumptions	Network connectivity, Uptime of DC is essential for migration					
Thromdes Expectations	Optimization of shared resources is to be considered.					

4.33 Identify disaster recovery site for data backup

Initiative	Identify disaster recovery site for data backup			
Phase	Score	Rating	TT Rank	PT Rank
3	6.58	Low	3	3

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Initiative		Identify disaster recovery site for data backup				
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.0	1.0	0.1	1.0	0.5		
Description of Initiative						
Overview	A disaster recovery site (DR) acts a backup for a data center. DR site is planned along with a DC to protect organization assets from a single point of failure if a DC is down. In the event of a disaster at the DC site, the DR site assumes the role of a DC from where operations will be undertaken.					
	There are three types of DR sites: Cold site – cold backup sites essentially are configured space in a building identified for assuming the role of a DC in the event of a disaster. Complete IT infrastructure is required to be procured or transferred to establish operations. Warm site – Warm backup site in addition to the cold site has existing IT infrastructure which may be commissioned to establish and operationalize the services. Hot site – Hot backup site is a mirror image of the DC wherein all infrastructure and services have been configured and switch-over time frame is limited to 4 – 8 hours.					
	Selection of the DR type is a business decision based on the criticality of services and constraints like resources and cost.					
Objective	Identify DR site for Thomde IT solutions.					
Rationale	As Thomdes are adopting ICT interventions to automate the services and internal operations, downtime or service unavailability (due to DC downtime) will impact the operations and citizen service delivery. Loss of information is another key constraint.					
Business Benefits	Data and information will be key for Thomdes with the ICT interventions under consideration. Thomdes are making considerable investments to digitize and ensure data quality. It is important that the data should be protected with due redundancy which a DR can provide to a DC.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	33	Identify disaster recovery site for data backup	-	90,000.00	90,000.00	0.0900
Risk Assessment	Considering the asset cost and investment required for establishing hot or warm DR site, due BCP plans and process is required to be established to identify requirements for DR.					
Technical	Rack space is required to be provided to Thomde as per					

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Initiative	Identify disaster recovery site for data backup
aspect	requirements. Typically DR infrastructure estimation is at 50% of DC capacity.
Timelines	Timelines are dependent on the time required to establish DC and DR.
Skill requirements	Infrastructure domain expert with configuration skills is required for the migration.
Dependencies & Assumptions	Network connectivity, Uptime of DC is essential for migration
Thromdes Expectations	None

4.34 Usage of VMs and shared SAN storage space in DC

Initiative	Usage of VMs and shared SAN storage space in DC			
Phase	Score	Rating	TT Rank	PT Rank
2	5.17	Low	4	3
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
2.8	0.9	0.5	0.6	0.4
Description of Initiative				
Overview	<p>Virtual machines (VM) is an operating system or application software which enables similar experience as on a dedicated hardware. The hardware resources are shared by the different instances of the VMs.</p> <p>There are multiple ways of implementing VMs as follows: Hardware level virtualization Operating system level virtualization</p>			
Objective	Promote use of VMs and shared SAN storage			
Rationale	Typically server utilization is around 20 – 30% depending on the server configuration and load. Through VMs the available system resources may be leveraged to deliver optimum utilization and economy of scale. SAN storage systems can also be used at a DC level by multiple bodies.			
Business Benefits	Through optimum use of infrastructure resources and sharing, the overall cost component for ICT infrastructure will be lower.			
Cost Analysis	DC and DR infrastructure to be leveraged at no additional costs to the Thromdes			
Risk Assessment	None			
Technical aspect	Selection of VM type is to be considered by the DC and DR hosting service provider.			
Timelines	Not applicable			
Skill requirements	Not applicable			

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Initiative	Usage of VMs and shared SAN storage space in DC
Dependencies & Assumptions	None
Thromdes Expectations	None

4.35 Augment existing bandwidth in Thromdes

Initiative	Augment existing bandwidth in Thromdes					
Phase	Score	Rating	TT Rank	PT Rank		
2	7.54	Medium	1	Dependent on TWAN		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
4.7	1.0	0.3	1.0	0.5		
Description of Initiative						
Overview	Network connectivity and bandwidth are two enablers to support centralized hosting of Thromde solutions in DC and DR. Moreover PoS and payment kiosks if implemented would require network connectivity (wifi or wired).					
Objective	Increase the available network bandwidth for Thromdes.					
Rationale	With the shift from LAN based locally hosted software to centrally hosted software, the demand on network connectivity will increase. In this regard, it is essential to increase the existing bandwidth to support the functionalities and operations through the software.					
Business Benefits	Improvement in bandwidth will enable officers to work efficiently on the online web based solution and also deploy payment systems (PoS and Kiosks).					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	35	Augment existing bandwidth in Thromdes	-	60,000.00	60,000.00	0.0600
Risk Assessment	None					
Technical aspect	None					
Timelines	Dependant on the timelines for hosting solution centrally in DC and DR					
Skill requirements	None					
Dependencies & Assumptions	Senior management approval required.					
Thromdes	Thimphu is currently connected to TWAN which is leveraged as the					

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Initiative	Augment existing bandwidth in Thromdes
Expectations	national backbone connecting all Government offices. It is proposed that Phuentsholing should also be connected to TWAN.

4.36 Introduce redundancy in network connectivity in Thromdes

360 Introduce Redundancy in Network Connectivity in Thromdes						
Initiative	Introduce redundancy in network connectivity in Thromdes					
Phase	Score	Rating	TT Rank	PT Rank		
NA	5.60	Low	NA	Dependent on TWAN		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
2.8	1.0	0.3	1.0	0.5		
Description of Initiative						
Overview	Network connectivity and bandwidth are two enablers to support centralized hosting of Thromde solutions in DC and DR. Moreover PoS and payment kiosks if implemented would require network connectivity (wifi or wired). Redundancy of network connectivity ensures reliability and availability of services.					
Objective	Introduce redundancy in network connectivity for Thromdes.					
Rationale	With the shift from LAN based locally hosted software to centrally hosted software, the demand on network connectivity will increase. In this regard, it is essential to add redundancy to the existing network connectivity to support the functionalities and operations through the software.					
Business Benefits	Redundancy in bandwidth will enable officers to work efficiently on the online web based solution and also deploy payment systems (PoS and Kiosks).					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	36	Introduce redundancy in network connectivity in Thromdes	-	19,200.00	19,200.00	0.0192
Risk Assessment	None					
Technical aspect	None					
Timelines	To be initiated after solution is hosted centrally in DC and DR					
Skill requirements	None					
Dependencies & Assumptions	Senior management approval required.					

Business Process Re-engineering Report

Initiative	Introduce redundancy in network connectivity in Thromdes
Thromdes Expectations	Thimphu is currently connected to TWAN which is leveraged as the national backbone connecting all Government offices. It is proposed that Phuentsholing should also be connected to TWAN.

4.37 Implement URL / Content Filtering solutions

Initiative	Implement URL / Content Filtering solutions					
Phase	Score	Rating	TT Rank	PT Rank		
NA	6.39	Low	NA	1		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
3.7	0.7	0.5	1.0	0.5		
Description of Initiative						
Overview	<p>Network connectivity and bandwidth are two enablers to support centralized hosting of Thromde solutions in DC and DR. Moreover PoS and payment kiosks if implemented would require network connectivity (wifi or wired).</p> <p>Although network bandwidth and redundancy initiatives have been proposed, it is also required that URL / content filtering solutions be implemented to protect existing bandwidth and enforce use of official sites only.</p>					
Objective	Implement URL / Content Filtering solutions					
Rationale	Protection of network bandwidth through URL / content filtering solution will in-turn free up bandwidth for focussed usage.					
Business Benefits	URL / Content filtering blocks non-authorized URLs and / or allows authorized URLs. This is turn will help in conserving bandwidth for the Thromdes.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex +Opex) (USD)	Total in USD Million
	37	Implement URL / Content Filtering solutions	2,500.00	1,500.00	4,000.00	0.0040
Risk Assessment	This may impact business operation unless list of authorized and non-authorized URLs is not specified.					
Technical aspect	25 end-user based licenses have been assumed for cost estimation based on the number of users for4 Thromdes over a time period of three years.					
Timelines	Implementation timelines typically would require two – three weeks for each Thromde per location.					
Skill requirements	None					

Business Process Re-engineering Report

Initiative	Implement URL / Content Filtering solutions
Dependencies & Assumptions	Senior management buy-in on the list of authorized and unauthorized URLs.
Thromdes Expectations	None.

4.38 Implement business rules engine / interface for changing tax / user

Initiative	Implement business rules engine / interface for changing tax / user					
Phase	Score	Rating	TT Rank	PT Rank		
NA	6.39	Low	3	2		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
3.7	0.7	0.5	1.0	0.5		
Description of Initiative						
Overview	Business Rules Engine (BRE) is a software application which enables business users to make changes in the business logic in a business process. Alternatively the same may be implemented through effective designing and programming to allow users to make changes to business entities (like tax rate, arrears) without making changes to the programming layer.					
Objective	Implement business rules engine or interfaces to allow users to make changes to tax rates or users					
Rationale	Any changes to tax rate, user roles, and access permissions require support from the software services team as it requires changes in the programming logic. Implementing BRE or interfaces will enable business users to reduce dependencies on the software services and development.					
Business Benefits	Implementing the system or the interface will reduce dependencies from the software services team thereby saving on support and change requirement costs.					
Cost Analysis	Id	INITIATIVE	Capex Total (USD)	Opex Total (USD)	Total (Capex + Opex) (USD)	Total in USD Million
	38	Implement business rules engine / interface for changing tax / user	3,000.00	-	3,000.00	0.0030
Risk Assessment	Interface implementation may require architecture, design logic based changes. This may impact existing source code or introduce new errors or defects and also change requests.					
Technical aspect	Existing system is expected to have few features with interfaces. It is proposed that the existing system should be allowed to stabilize while users can access the system and identify areas of improvement.					

Business Process Re-engineering Report

Initiative	Implement business rules engine / interface for changing tax / user
	<p>The changes may be consolidated into a change request for the software services team.</p> <p>Once the change request is approved, a decision is to be taken on one of the approaches:</p> <ul style="list-style-type: none"> a) implementation of interfaces b) implementation of BRE <p>The decision is to be undertaken depending on the scope of work and efforts required to enable changes by implementing interfaces. This will in-turn depend on modular programming and design patterns adopted during development.</p>
Timelines	Timelines will be dependent on the number of changes required in the change request submitted by the Thomdes.
Skill requirements	For both the approaches key experience is required in terms of understanding on the existing RMS system design and source code. At least 2 developers would be required for 3 months dependent on medium (3-5) consolidated change requests.
Dependencies & Assumptions	None
Thromdes Expectations	Dependencies on the software development team should be minimised and access given to the users to introduce applicable changes as per policy.

4.39 Implement asset management policies and tools to manage assets

Implement asset management policies and tools to manage assets						
Initiative	Implement asset management policies and tools to manage assets					
Phase	Score	Rating	TT Rank	PT Rank		
NA	6.07	Low	NA	NA		
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient		
3.3	0.7	0.5	1.0	0.5		
Description of Initiative						
Overview	Asset management policies and tools allow IT admin users to manage and monitor existing IT assets of an organization.					
Objective	Implementing asset management policies and tools					
Rationale	Thromdes are investing on IT software licenses & development, infrastructure, network and end user devices. It is important to maintain the inventory for the same for management, monitoring and audit purposes.					
Business Benefits	Protection and management of existing investments in IT assets is critical. Asset management tool will enable users to manage & monitor the investments and policies will serve as guidelines for the users.					
Cost Analysis	<div>Id</div>	<div>INITIATIVE</div>	<div>Capex</div>	<div>Opex</div>	<div>Total</div>	<div>Total</div>

Business Process Re-engineering Report

Initiative	Implement asset management policies and tools to manage assets					
			Total (USD)	Total (USD)	(Capex + Opex) (USD)	in USD Million
	39	Implement asset management policies and tools to manage assets	3,666.67	1,000.00	4,666.67	0.0047
Risk Assessment	None					
Technical aspect	None					
Timelines	None					
Skill requirements	None					
Dependencies & Assumptions	Thromdes have an existing asset management which is being projected to be used for asset management.					
Thromdes Expectations	None.					

4.40 Establish a centralized governance model (IT)

Initiative	Establish a centralized governance model (IT)			
Phase	Score	Rating	TT Rank	PT Rank
1	5.75	Low	2	3
Benefit quotient	Execution quotient	Cost quotient	Risk quotient	Time quotient
3.4	0.8	0.5	0.6	0.4
Description of Initiative				
Overview	<p>Each Thromde has their own dedicated IT support team to look after the network, infrastructure and software modules. This in turn creates redundant resources who will be looking after similar components across different locations.</p> <p>Thromdes are now looking forward to new initiatives like:</p> <ul style="list-style-type: none"> Data center and disaster recovery site Network connectivity (TWAN) Software modules – RMS Integration modules – Payment, Email and SMS gateway Data quality controls GIS spatial data and software AMRs / meter tablets Reporting & BI Security policies and systems 			
Objective	Plan and establish a centralized governance model (IT) to look after shared functions and systems			

Business Process Re-engineering Report

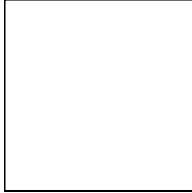
Initiative	Establish a centralized governance model (IT)
Rationale	<p>With new technology interventions being planned for all Thromdes, due augmentation of IT team would also need to be considered. There are following approaches discussed on the same:</p> <p>each Thromde develops their own IT team to look after respective system components all Thromdes together plans for a centralized team to focus on the requirements MoIC / MoWHS establishes a central IT team to look after Thromde requirements</p> <p>Key constraints which are to be considered are:</p> <p>developing separate disparate teams to look after similar work for each Thromde will cause redundancies central team for Thromdes would require due planning and SLAs to be defined for sharing resources MoIC / MoWHS team, if implemented, would need dedicated resources for the Thromde systems</p> <p>Taking above factors and inputs received from Thromde management, it is proposed that option 2 – dedicated team to be established by Thromdes would be aligned to the specific requirements.</p>
Business Benefits	Central IT governance team will ensure sharing of resources and cost optimization.
Cost Analysis	None
Risk Assessment	Sharing would be dependent on services framework which in turn would require establishing service definitions and contracts along with SLAs and MOUs between Thromdes and IT team
Technical aspect	The team is required to be designed taking into considering existing initiatives and future initiatives proposed / pipelines.
Timelines	This is dependent on the senior management approval and mutual understanding between the Thromdes.
Skill requirements	<p>Resources are required to be identified with technical and managerial skills on the following components at least:</p> <p>Data center and disaster recovery site Network connectivity (TWAN) Software modules – RMS Integration modules – Payment, Email and SMS gateway Data quality controls GIS spatial data and software AMRs / meter tablets Reporting & BI Security policies and systems</p>

Business Process Re-engineering Report

Initiative	Establish a centralized governance model (IT)
Dependencies & Assumptions	Senior management buy-in and mutual understanding between Thromdes is required
Thromdes Expectations	None.

5. Annexure

5.1 Consolidated Initiatives Worksheet



5.2 BPR Workshop Presentation



BUDP II - Deliverable
6 - BPR.pptx

5.3 Thimphu Thromde Master Plan



Thimphu Thromde -
Master Plan.docx

5.4 Phuentsholing Thromde Master Plan



Phuentsholing
Thromde - Master Pla

