Implementation of Data Alignment Measures for the Alignment of Planning, Lands and Public Works Data

Final Report (Volume 1 of 3)
Main Text

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The Government of the Hong Kong Special Administrative Region
Housing, Planning and Lands Bureau

Azeus Systems Limited

Distribution
Architectural Services Department (ArchSD)
Buildings Department (BD)
Census and Statistics Department (C&SD)
Civil Engineering Department (CED)
Drainage Services Department (DSD)
E&M Services Department (EMSD)
Highways Department (HyD)
Housing, Planning and Lands Bureau (HPLB)
Commerce, Industry & Technology Bureau (CITB)
Information Technology Services Department (ITSD)
Lands Department (LandsD)
Land Registry (LR)
Planning Department (PlanD)
Rating and Valuation Department (RVD)
Territory Development Department (TDD)
Water Supplies Department (WSD)
Azeus Systems Ltd.

Volume Index

List of Abbreviations

A&A	Alteration & Addition
ACPC	Administrative Computer Projects Committee
AFCD	Agriculture, Fisheries and Conservation Department
ALS	Authorized Land Surveyor
ArchSD	Architectural Services Department
ASTM	American Society for Testing and Materials
B/D	Government Bureaux / Departments
BCIS	Building Condition Information System
BD	Buildings Department
BDIS	Building Development Information System
BDRIS	Building Dilapidation and Rehabilitation Information System
BMS	Basic Mapping System
BP	Business Partners
C&SD	Census and Statistics Department
CAD	Computer Aided Drawing
CC	Certificate of Compliance
CCGO	Central Cyber Government Office
CED	Civil Engineering Department
CEDes	Current Environment Description
CF	Compatibility of File Format
CIS	Cadastral Information System
CITB	Commerce, Industry and Technology Bureau
CLIS	Computerized Land Information System
CSRLP	Computerized Slope Registration and Location Plan System
CSU	Common Spatial Unit
CSU ID	Common Spatial Unit Identifier
CSWP	CAD Standard for Works Projects
CTS	Comprehensive Transport System
DAF	Data Alignment Framework
DAM	Data Alignment Measures
DAS	Data Alignment Strategy
DBF	DBase IV
DC	District Council
DCCA	District Council Constituency Area
DCT	Data Conversion Tool
DD	Data Definition
DDS	Data Dissemination System
DF	Data in Digital Format
DGN	Design File
DITP	Departmental IT Plan
DLO	District Lands Office
DMS	Digital Mapping System
DO	District Office

DPP	Department Portal Programme
DQ	Data Quality
DSD	Drainage Services Department
DSO	District Survey Office
DSU	Departmental Spatial Unit
DT	Disturb Terrain
DWG	Drawing File
DXF	Drawing Exchange File
E00	ARC Export File Format
EI	Engineering Inspection
EMSD	Electrical and Mechanical Services Department
ESD	Electronic Services Delivery
ETWB	Environment, Transport and Works Bureau
FC	Finance Committee
FGDC	Federal Geographic Data Committee
FS	Feasibility Study
FSD	Fire Services Department
GEO	Geotechnical Engineering Office
Geo. Ref. No.	Georeference Number
GFA	Gross Floor Area
GIH	Geospatial Information Hub
GIRS	Geographic Information Retrieval System
GIS	Geographic Information System
HA	Housing Authority
HD	Housing Department
HKPF	Hong Kong Police Force
HKSARG	The Government of the Hong Kong Special Administrative Region
HOS	Home Ownership Scheme
HPLB	Housing, Planning and Lands Bureau
HS	Housing Society
HyD	Highways Department
IF	Interoperability Framework
IFCG	Interoperability Framework Co-ordination Group
IRIS	Integrated Registration Information System
ISO	International Standardization Organisation
ITMU	Information Technology Management Unit
ITSD	Information Technology Services Department
IVS	Interim Valuation System
KRA	Key Result Area of 2001 Digital 21 Strategy
LandsD	Lands Department
LAO	Land Administration Office
LAS	Lands Authority (LandsD is the authority on land-related issue)
LDH	Land Data Hub
LIC	Lands Information Centre
LPM	Landslip Preventive Measures
LR	Land Registry

LRS	Land Registration System
LWB	Lands and Works Branch (now the ETWB)
MCS	Metadata Catalogue System
MDB	Memorial Day Book
MID	MapInfo Data
MIF	MapInfo Interchange Format
MOE	Means of Escape
MPD	Mean Principal Datum
MR	Maintenance Responsibility
ND	Natural Terrain Defense Measure
NGDF	National Geospatial Data Framework
NS	Natural Terrain Stabilization Measure
NSDI	National Spatial Data Infrastructure
NTEH	New Territories Exempted House
OGC	Open GIS Consortium
OO	Object-oriented
OP	Occupation Permit
PAH	Project Administration Handbook
PD	Participating Department
PDPO	Personal Data (Privacy) Ordinance
PELBTC	Planning, Environment and Lands Branch Technical Circular
PlanD	Planning Department
PLBITC	Planning and Lands Branch Information Technology Committee
PLW Data	Planning, Lands and Public Works Data
PLW Study	Consultancy Study on the Alignment of Planning, Lands and Public Works Data
PMS	Property Management System
PPU	Primary Planning Unit
PRN	Property Reference Number
PSPS	Private Sector Participation Scheme
PVS	Planning, Vision and Strategy
PWD	Public Works Department
RD	Related Departments
RDMS	Road Data Maintenance System
RFI	Request For Information
RMA	Recommended Mode of Adoption
RVD	Rating and Valuation Department
SAR	Situation Analysis Review
SB	Street Block
SCOPES	Shared Common Platform for Electronic Services
SDR	Sub-division Registers
SIS	Slope Information System
SMO	Survey and Mapping Office
SMRIS	Slope Maintenance Responsibility Information System
SPICA	Shared Platform for Internet Content and Applications
SPU	Secondary Planning Unit

TAC	Technical Assurance Coordinator
TC	Technical Circular
TCW	Technical Circular (Works) of ETWB
TD	Transport Department
TDD	Territory Development Department
TF	Task Force
TIS	Transport Information System
TPEDM	Territorial Population and Employment Distribution Model
TPIS	Town Planning Information System
TPO	Town Planning Ordinance
TPU	Tertiary Planning Unit
TT	Turnaround Time
UAC	User Assurance Coordinator
UR	User Requirements
VC	Village Cluster
WB	Works Bureau
WBTC	Works Branch Technical Circulars. Works Bureau Technical Circulars, or ETWB Technical Circular (Works)
WG	Working Group
WGPD	Working Group of Population Distribution
WSD	Water Supplies Department

Amendment History

Change Number	Revision Description	Pages Affected on Respective Version	Revision / Version Number	Date	Approval Reference
0	Initial Release		1.0	4 Mar 2004	

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1 Management Summary

1.1 Background

1.1.1 In recent years, significant progress has been made in Environment, Transport and Works Bureau (ETWB) and Housing, Planning and Lands Bureau (HPLB) departments on employing geographic information systems (GIS) in capturing, updating and analyzing geographic data. Some departments might have already implemented several GIS while some are having their GIS under different stages of development. There is a genuine need to exchange planning, lands and public works (PLW) data generated from their systems, including but not limited to the GIS system or from Computer Aided Drawing (CAD) system to meet individual department needs or the business collaboration need of the departments. Despite the investments made on the GIS, there is room to improve the efficiency and effectiveness in the data exchange processes which could include geospatial data, CAD drawings and textual data, either in digital or in hard copy format. Currently, these data are separately collected, stored or produced in individual departments. Improvements are required to address deficiencies arising from data definition, data in digital format, compatibility of data format, data quality, data cost and turn around time.

1.1.2 HPLB started an initiative to align the exchange of PLW Data among different participating departments in early 2000. The Final Report of the Consultancy Study on the Alignment of Planning, Lands and Public Works Data (PLW Study) recommended a Data Alignment Strategy (DAS), a component of which includes Data Alignment Measures (DAM) to address pressing data exchange problems within the participating departments (PDs).

1.1.3 Data Alignment Strategy (DAS) consists of two parts:

(a) Data Alignment Measures (DAM) - These are near term measures recommended for providing quick relief within a time frame of about one year; and

(b) Data Alignment Framework (DAF) - The DAF is a long-term solution for a comprehensive data-sharing framework. The DAF vision is developed with reference to international best practices, including the key features in spatial data infrastructures of leading countries on GIS.

1.1.4 The DAS initiative is a complementary policy, conforming to the overall e-Government policy as stated in Digital 21 Strategy (http://www.info.gov.hk/digital21) promulgated by the Government of the Hong Kong Special Administrative Region (HKSARG). In this DAS initiative, B/Ds should collaborate to work together and demonstrate that Key Result Area 2 “To ensure that the Hong Kong Government leads by example” can be accomplished in the context of PLW data exchange.

1.1.5 Azeus was awarded the contract to provide services to implement the six measures in DAM on 2 October 2002 and the project commenced on 16 October 2002. This project includes the following participating bureaux / departments:

(a) Participating departments include: ArchSD, BD, C&SD, CED, DSD, EMSD, HyD, LandsD, LR, PlanD, RVD, TDD and WSD. ITSD was assigned to take up the role of Technical Advisor in the project.

(b) Participating Bureaux include HPLB, ETWB and CITB.

1.2 Scope

1.2.1 There are six measures included in the DAM and they are complementary to each other. Since the commencement of the project, there were some changes reported in the current environment. With the approval of HPLB, the scope of the project was adjusted accordingly and summarized as below:

(a) DAM 1: Common Spatial Units (CSU) – to establish CSU's for solving the data definition problems of the most commonly exchanged geospatial data among PDs. Five CSUs have been identified. They include Slope, Building, Lot, Road Centreline and Tertiary Planning Units / Street Blocks (TPU / SB).

(b) DAM 2: Standardisation of symbology for graphic entities – to establish an inventory of GIS data containing the map style, map series, GIS platform details and the name of PD who maintains symbols specification. This information would be useful to other PDs in case when they want to reproduce the symbols for a specific purpose.

(c) DAM 3: Standards on the file formats for exchanging data – to streamline file conversion through standards on the file formats for exchange of data.

(d) DAM 4: Policy on exchange of data in electronic form – to formulate appropriate policy relating to the exchange of PLW Data.

(e) DAM 5: Metadata catalogue service – to leverage the facilities now available with LandsD and to enhance the LandsD's Metadata Catalogue System (MCS) to meet the requirements for the catalogue service of the metadata documentation of the PDs.

(f) DAM 6: Metadata production tools – to prepare an inventory report of metadata tools now being maintained by PDs.

1.3 Solutions

1.3.1 The data exchange processes documented in the Final Report of the PLW Study with relevance to the measures of DAM were reviewed. The recommended solutions would be able to provide short-term measures to mitigate the problems as were originally discussed in the Final Report of the PLW Study. The below figure illustrates the stages of development of the Data Alignment Strategy (DAS).

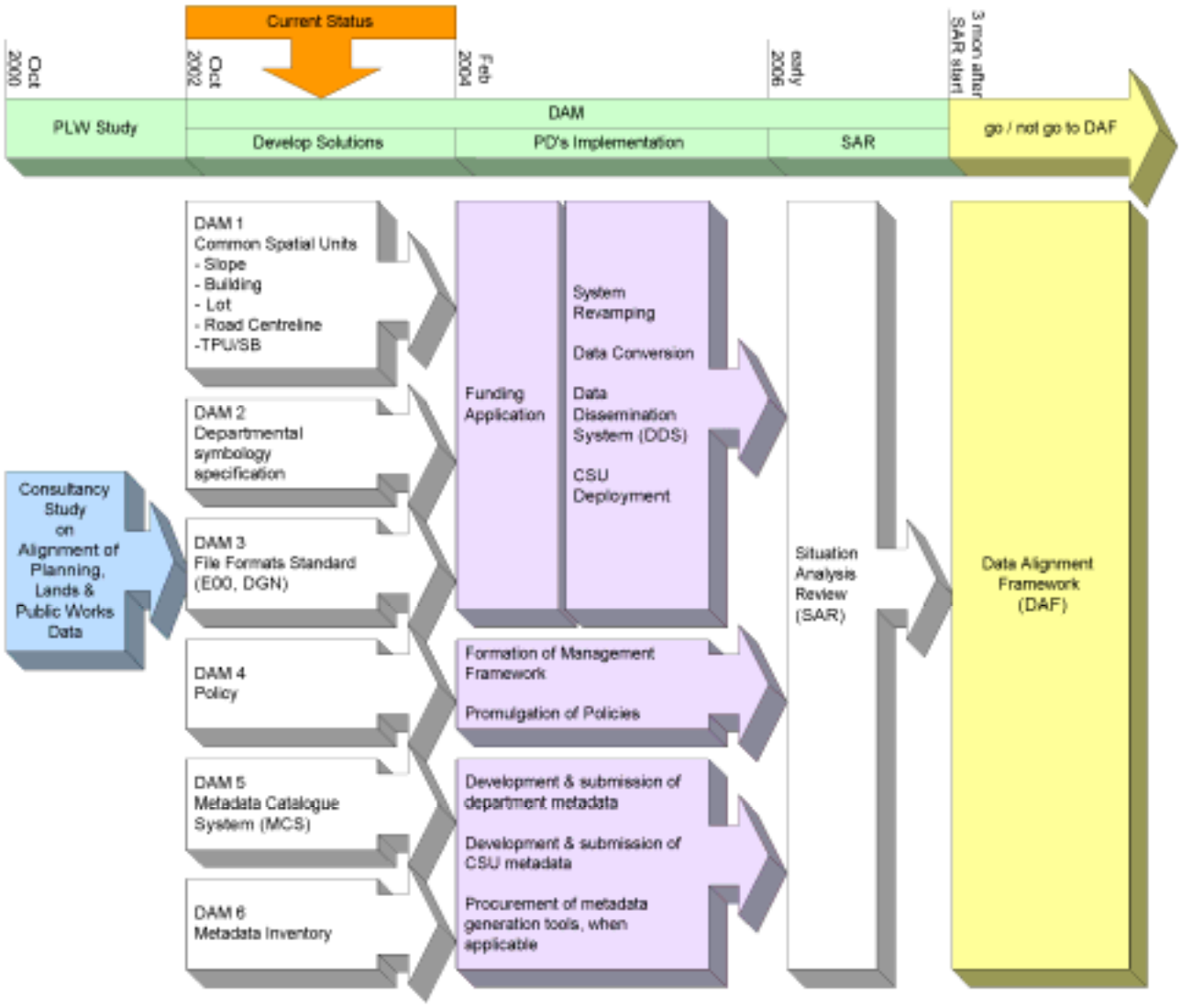


Figure 1 Stages of development of Data Alignment Strategy (DAS)

DAM 1

1.3.2 CSU is the standard unit for exchange of geospatial data, comprising spatial data and a set of common attributes.

1.3.3 To address the data definition issues, 5 Common Spatial Units (CSUs) are proposed in DAM 1. They are:

(a) Slope CSU;

(b) Building CSU;

(c) Lot CSU;

(d) Road Centreline CSU; and

(e) TPU / SB CSU.

1.3.4 There is a business need to align the above five CSUs covering different business domains. Their scopes need to be managed such that they can be implemented within the jurisdiction of the PDs and within the committed timeframes.

1.3.5 Specification and explanatory notes are prepared for each of the above named CSUs. Each specification covers the below aspects:

(a) CSU Definition – includes the scope and coverage of data, common rules for delineation and / or shapes of polygons / lines, common attributes, CSU ID and data custodianship.

(b) Revised Workflow on implementation of CSU.

(c) CSU Data Interface Requirements – include CSU Status, Themes, Logical Data Structure and Entity Description.

(d) Maintenance of CSU – includes data provision frequency, data dissemination frequency and mode of dissemination.

1.3.6 The CSU definition should meet the following criteria:

(a) The CSU scope is manageable within the committed timeframe and the business definitions shall be aligned with all stakeholders PDs.

(b) The common rules for delineation and shapes of polygons should be consistent among PDs with the aligned business definitions of the CSUs.

(c) All attributes of the CSU should be well defined with respect to its physical meaning, accuracy and its need priority (i.e. if it is a mandatory attribute or optional attribute).

(d) Each CSU shall be identified by a CSU ID which is unique and persistent. PDs, in particular the Data Agent, should also review the technical feasibility of adopting the CSU ID in their existing system and the corresponding impact.

(e) Data custodianship and ownership of each attribute should be well defined and is under the jurisdiction of PDs. Details of the responsibilities of the Data Agent, Data Owner and Data User are discussed in section 10 – DAM 4 Policy.

DAM 2

1.3.7 Presently, there is no dominant international geospatial symbology standardization initiative underway. Nevertheless, within particular nations, specific bodies have established domain-specific symbology specifications for the production of particular GIS derived map products.

1.3.8 It is recommended that PDs should have the autonomy to choose their own symbols for their specific presentation purposes. Re-symbolisation is not considered as part of a conversion process. Rather, re-symbolisation is part of the design, development, and production processes for maps and drawings. As a

result, it is not mandatory for PDs to adopt the symbology standards defined by source agent (e.g. Data Owners for Common Spatial Unit, CSU).

1.3.9 For the benefit of the Data Users who want to reproduce the symbols from the data source agencies, information about the symbol specification should be made available from the data source agencies (e.g. Data Owners of CSU) to depict the exchanged datasets when requested by the Data Users.

1.3.10 An inventory of standard maps and other technical details is discussed in section 7.

DAM 3

1.3.11 The objective of DAM 3 is to standardize geographic data file formats and to mitigate the data exchange problems that arise from data format interoperability and compatibility issues.

1.3.12 For DAM purpose, a File Formats Standard is recommended. In addition, there are data conversion tools (DCTs) in the market that could support the conversion from common proprietary formats into the recommended file formats and vice versa.

1.3.13 The recommended File Formats Standard in DAM 3 covers formats for geospatial data and formats for its associated textual attributes. Except for metadata standard which is discussed in DAM 5 and DAM 6, file formats for textual data that do not associate with geospatial data should follow the recommendations of the Interoperability Framework (IF). (http://itginfo.ccgo.hksarg/content/if)

1.3.14 Among the different candidates of File Formats Standard considered, E00 (Exported from Arc/Info Coverage Version 7.x) and DGN v7 (3D[1]) with attributes storing in separated files are recommended as the initial set of File Formats Standard for geospatial information. For E00 format, textual attributes of the geospatial data can be embedded within the file. For DGN format, associated textual attributes should be stored in a DBF file which is linked to the DGN using MSLINK.

1.3.15 Technical details and recommended mode of adoption are covered in section 8.

1.3.16 When considered appropriate, the Interoperability Framework Co-ordination Group (IFCG) will choose to include the relevant documentations on the defined standard into the IF document library.

[1] It is understood that LandsD provides basemap in DGN with settings for three-dimensional (3D) drawings. The setting (i.e. 3D) is for elevation (i.e. z-value) of contour lines. On the other hand, as specified in CSWP, 3D DGN should be used for CAD Drawings exchange amongst Works Departments. In viewing that both the LandsD and Works Departments exchange DGN using the settings for 3D, 3D DGN is recommended in the File Formats Standard.

DAM 4

1.3.17 Since DAM would involve multiple B/Ds from different jurisdictions, alignment of business agenda among B/Ds on the implementation of DAM are crucial to the success of DAS. A strong, well-represented, efficient and effective management framework is needed to promulgate complementary policies for the implementation of DAM. DAM 4 proposes the promulgation of the management framework with the issuance of a new Technical Circular and Practice Notes.

1.3.18 It is proposed that a management framework should be set up to oversee the implementation of DAM, the Situation Analysis Review and later implementation of DAF. A two-tier organization structure, comprises a DAS Task Force and a DAM Management Committee, is recommended. Figure 2 illustrates the provisional DAS organization structure.

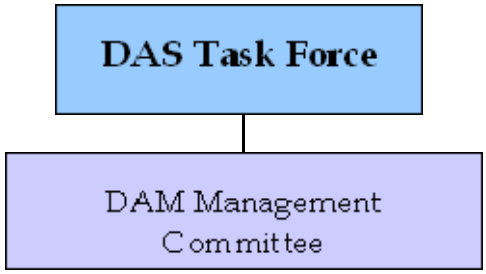


Figure 2 Provisional DAS Organisation Structure

1.3.19 The proposed management framework shall oversee the implementation of complementary policy and also Data Alignment Measures (DAM). In the context of DAM, its mandate shall include the maintenance of the releases of the latest update of the practice notes covering the requirements for the implementation and subsequent maintenance of Common Spatial Units (CSU), accountability for care and maintenance, custodianship principle, mechanism (including processes and procedures) for maintenance of CSUs, maintenance of GIS map inventory, file format standard and metadata.

1.3.20 Complementary policies to be promulgated by the management framework should conform to the Digital 21 Strategy which shall be in place to set the direction on how B/Ds should work together and to accomplish the following objectives:

(a) Roadmap of DAM and its migration to DAF

(i) Foster the long term partnering arrangement among PDs who are committed to ensure that they lead by example to improve efficiency and effectiveness on the exchange of PLW data. This could help accomplish a higher return from the investment for the government as a whole and minimize overlapping B/D initiatives.

(ii) Align other similar initiatives of other B/D. DAM includes measures good for exchange of CSU and non CSU data. There are other provisions in CSWP and IF which are useful for exchange of

non CSU data. The subsequent maintenance of DAM, CSWP and IF should be well coordinated such that the overall infrastructure will complement each other. Apart from the initiatives on the infrastructure, the GIS initiatives of B/Ds should be aligned with each other such that GIS technology could be deployed to its best capabilities and overlapping initiatives should be avoided.

(iii) Provide continuity and a smooth transition from DAM to DAF. DAM provides interim measures to improve efficiency and effectiveness in the exchange of PLW data. The policy should set a common vision that could be shared by all PDs and the DAM would migrate to DAF in terms of:

- Increasing number of participating departments
- More CSUs defined to meet the common business needs of the PDs
- Leverage on the standards already built in other initiative(s) or develop new standard, e.g. CSWP and IF and contribute to the common data standard at HKSAR government level if applicable
- A better integrated infrastructure that could be shared for data storage and dissemination of metadata and business aligned PLW data (available in File Formats Standard), query and analysis

(b) Efficiency Productivity Programme

(i) Encourage PDs to identify areas good for business process reengineering in the context of DAM. Such initiatives should be encouraged. PDs could possibly obtain assistance from an agency who could provide expertise and advice on how reengineering could be accomplished.

(ii) Encourage B/Ds to synergise the investment already invested or to be invested by PDs on GIS and improve sharing of experience and knowledge in GIS technology. These GIS initiatives of the PDs could have been better coordinated from business perspective. Well-coordinated investment among PDs could help synergise the investment already invested by PDs on GIS. This could also help avoid duplication of effort, and then benefit from higher return on coordinated investment and reduction of overall maintenance expenditure. Another important benefit is that departments can have more resources to focus on their core duties.

1.3.21 It is recommended that all participating B/Ds should sign on a common agreement with the above said objectives.

1.3.22 Implementation of DAM 4 would be complemented with the issuance of a new Technical Circular and Practice Notes. The new Technical Circular shall announce

the implementation of Data Alignment Strategy and the associated Data Alignment Measures for the exchange of planning, lands and public works data. The Technical Circular would also promulgate a provisional DAS Organisation Structure. Practice Notes would be issued to illustrate the technical details of the standards to be promulgated.

DAM 5 and DAM 6

1.3.23 Geospatial metadata is the data about geospatial data set. It describes the content, quality, condition and other characteristics of the data. The metadata shall conform to FGDC requirement or the latest standard promulgated by the respective Bureau.

1.3.24 In the context of DAM, the generation of the metadata would be carried out by the Data Agent of each CSU who have to implement a CSU data dissemination system. The data dissemination system will have its automated tool for metadata production purpose. The Data Agent of each CSU has to maintain the metadata documents of the CSU. The produced metadata should be submitted to the Metadata Catalogue System hosted by LandsD. DAM 5 implements enhancements to a Metadata Catalogue System hosted by Lands Department to include metadata of the CSUs. Lands Department, being the Data Agent of the Building, Lot and Road Centreline CSUs, will produce metadata of these three CSUs under its data dissemination system. CED and PlanD, as the nominated Data Agents for the Slope and TPU / SB CSUs respectively, will produce metadata for the two CSUs using the tools already available from their existing data dissemination systems. For non-CSU GIS metadata, other departments have already been producing the required metadata. DAM 6 will document an inventory of metadata and an inventory of department-based metadata tools.

1.4 Current Recurrent Cost

1.4.1 In the recommendation of the previous PLW Study, it was pointed out that the identified tangible benefits from DAM and the investment cost cannot breakeven. However, the DAM and DAF strategies should not be considered on the merits of tangible benefits alone. DAS should be considered as a strategic imperative. It is fundamental for enabling the HKSAR Government's e-initiatives, as this undertaking will include a clear solution around data consistency of PLW data at an enterprise level, not just within independent departments.

1.4.2 All PDs agreed that there are benefits in the implementation of DAM by streamlining PLW data exchange processes. In the DAM project, PDs have reviewed and adjusted the cost and benefit figures documented in the PLW Study. The same conclusion in section 1.4.1 remains.

1.4.3 B / Ds are committed to the implementation of DAM. Since new work processes would be introduced in the revised workflow upon the implementation of DAM, PDs would need time to evaluate how these new processes would impact on the resources. It is agreed that the effectiveness and benefit of DAM will be evaluated in the Situation Analysis Review (SAR) to be conducted after deployment of DAM.

1.4.4 The cost benchmark, which summarizes the recurrent costs in the current environment, will form the basis on which PDs would evaluate the impact to the recurrent costs on the implementation of DAM. A high level estimation on the potential costs saving provided by PDs[2] has been conducted, whereas a detailed evaluation would be conducted in the SAR stage.

1.4.5 Total cost of all current data exchange processes relevant to DAM 1 to 3 is approximately HK$5M. The apportioned costs for DAM 1 to 3 are HK$2.1M, HK$517K and HK$2.3M respectively. The total estimated potential tangible savings from the implementation of DAM 1 to 3 are only about HK$83K.

1.5 Benefits on Implementation of DAM

1.5.1 The main tangible benefit of DAM is cost savings associated with staff resources in the post processing processes and the reengineering processes in the revised workflows on implementation of DAM. These savings would be further reviewed in the SAR.

1.5.2 Apart from the tangible benefit, the intangible benefits include improvements in quality of information and improved availability of information. One crucial component of the savings is likely from the synergy of overlapped initiatives.

1.6 Costs on Implementation of CSU

Data Conversions

1.6.1 An one-off data conversion exercise is required to consolidate the relevant data currently maintained by individual PDs and to establish an initial dataset of each CSU prior to the implementation of the future CSUs' workflows. The respective data providers / Data Owners and Data Users have prepared their own estimates for the resources required to complete this one-off data conversion exercise.

System Revamping

1.6.2 To conform to the interfacing requirements, enhancements of PDs' existing systems are required prior to the implementation of CSU. These enhancements include both technical measures - such as system revamping, enhancements and / or implementations to facilitate data provision and data dissemination.

[2] Some PDs have not provided an estimation of the potential savings. The estimation are very rough estimates provided by PDs in consideration of the reduced efforts from current data exchange processes - the future data exchange processes in the CSU workflows would be quite different from those in the current environment.

Cost summary for Revamping and Data Conversion

1.6.3 The overall estimated total system revamping costs and one-off data conversion efforts of the 13 PDs amount to HK$14M and HK$7M respectively for the 5 CSUs, as illustrated in Table 1 and Table 2.

System Revamping						
	Slope	Building	Lot	Road C	TPU/SB	Total
ArchSD	700,000	0	0	0	0	700,000
BD	0	465,000	0	0	0	465,000
CED	1,175,854	0	0	0	0	1,175,854
C&SD	0	492,362	0	0	0	492,362
DSD	500,000	0	200,000	0	0	700,000
EMSD	0	0	0	0	0	0
HyD	1,745,416	0	0	0	0	1,745,416
LandsD	68,884	3,303,825	3,229,821	751,956	0	7,354,485
LR	0	0	0	0	0	0
PlanD	0	353,000	0	0	50,000	403,000
RVD	0	185,900	0	0	0	185,900
TDD	0	0	0	0	0	0
WSD	732,936	0	0	0	0	732,936
Total	4,923,090	4,800,087	3,429,821	751,956	50,000	13,954,953

Table 1 Revamping Costs Estimated in PDs per CSU

Data Conversion						
	Slope	Building	Lot	Road C	TPU/SB	Total
LandsD	0	916,716	148,456	74,228	0	1,139,400
RVD	0	5,791,500	0	0	0	5,791,500
Total	0	6,708,216	148,456	74,228	0	6,930,900

Table 2 Ballpark Figures on Data Conversion Costs

1.7 Data Dissemination

1.7.1 To support CSU data exchange processes, Data Agent should own and maintain a system that serves the below two purposes:

(a) Data provisions from Data Owners to Data Agent

(b) Data dissemination by Data Agent to Data Users

1.7.2 In view of the interim measures in the context of DAM, Data Agents would have to make use of the existing IT infrastructure, when applicable, for the above stated purposes. The channel of data dissemination for the five CSUs are as follows:

(a) CED's existing Intranet web site is recommended and will be enhanced for Slope CSU dissemination.

(b) PlanD will disseminate the TPU / SB CSU via the Department Portal Programme (DPP).

(c) LandsD, being the Data Agent of the three CSUs (Building, Lot and Road Centreline), will host the data dissemination system and be responsible for

disseminating these three CSU datasets. A feasibility study supplementary to the Feasibility Study of LandsD Data Dissemination System (DDS) is currently in progress to review if the infrastructure to be provided for data dissemination of Building CSU, Lot CSU and Road Centerline CSU by the Data Agent (i.e. LandsD) could share with the infrastructure to be provided in LandsD's DDS. It is scheduled that the supplementary study would be completed by June 2004.

1.8 Implementation Schedule

1.8.1 The time required for implementation vary by CSUs:

(a) Slope CSU - 12 elapsed months

(b) Building CSU - 15 elapsed months

(c) Lot CSU - 14 elapsed months

(d) Road Centreline CSU - 11 elapsed months

(e) TPU / SB CSU - 4 elapsed months

1.8.2 It is from the original project brief that 12 months are allowed for DAM implementation. In view of the procedures required for procurement of funding resources, prior studies, system enhancements and data conversions, more time is required prior to implementation of DAM. Given the preparation time required for CSU and on the assumption that the data conversion and system revamping schedules will commence in early 2004, the overall implementation timeframe is illustrated in Figure 3:-

(a) TPU / SB CSU can be implemented in Q2 2004;

(b) Slope CSU is scheduled to be implemented by mid 2005;

(c) Building CSU, Lot CSU and Road Centreline CSU are not likely to be implemented by mid 2005 since the one-off data conversion exercise would take around 15 man-months to complete. The corresponding schedules for the 3 CSUs are:

(i) Building CSU is prioritized to be implemented first, to be available by Q2 2005.

(ii) Lot CSU will be implemented in late 2005.

(iii) Road Centreline CSU will be implemented in Q1 / Q2 2006.

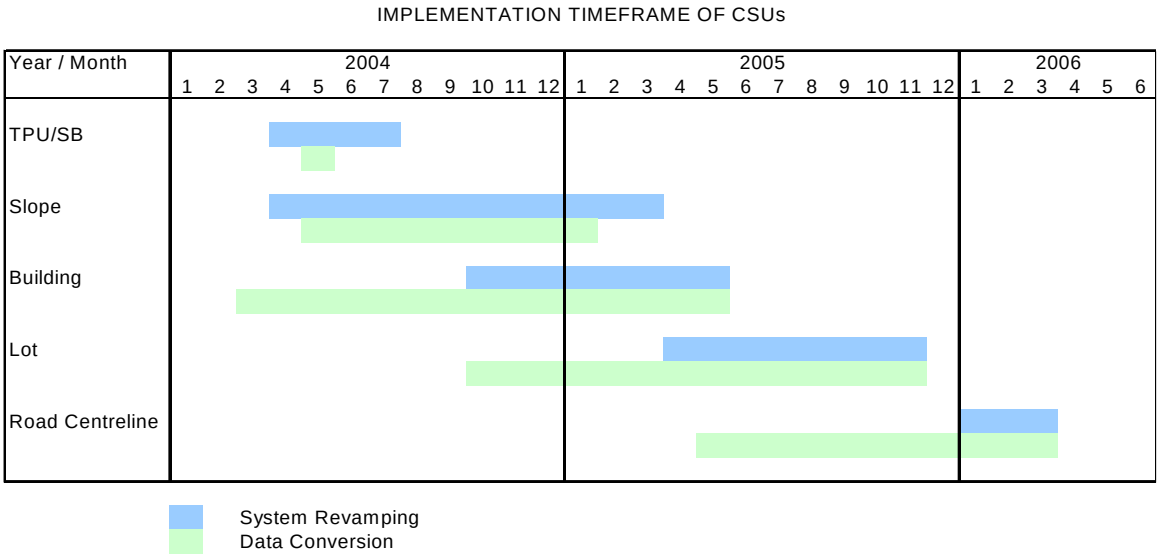


Figure 3 Implementation Timeframe of CSUs

1.9 Way Forward

Advance Tasks List

1.9.1 In addition to the planned system revamping and data conversions, a number of advance tasks are recommended. These include, but not limited to the following:

(a) All PDs should undertake the following tasks:

(i) Work together and identify if there is inter-department processes good for business process reengineering purpose.

(ii) Submit funding application, when applicable; make resources available according to the implementation plan of DAM

(iii) For PDs who collect, store and produce geospatial information in digital formats, they should prepare and submit metadata to Metadata Catalogue System (MCS) hosted by LandsD

(b) CED should undertake the following tasks

(i) Update Geoguide5 specification to mandate slope submission in softcopy

(ii) Provide training to business partners to improve and to standardize the data quality in slope submission

(c) LandsD should undertake the following tasks:

(i) Revise B1000 Specification to meet new requirements arising out of DAM

(ii) Improve LandsD specification of road centreline CSU

(iii) Provide training to GIS PDs for preparation and submission of metadata to MCS

(d) LR should enhance IRIS for Lot CSU, as per Lot CSU implementation schedule

(e) HPLB should undertake the following tasks:

(i) Approach candidates for GIS advisor and BPR advisor for the DAS Management Framework

(ii) Arrange all PDs to sign on a common agreement for DAM implementation

(iii) Develop a plan to extend DAM to other non PDs, actions include but not limited to:

(1) Initiate conversation with PDs and non PDs to study the necessity and feasibility of a new CSU – multi-road centreline

(2) Invite non-PDs to participate in the DAM

(iv) Design common XML schema for CSUs

(v) Enforce PDs submission of metadata to LandsD

(vi) Work with CITB to develop an effective mechanism to improve the information sharing which would in turn help the policy bureaux make decision in respect of funding approval

(vii) Coordinate policy support to GIS initiatives at Planning and Lands Branch Information Technology Committee (PLBITC) level and to transfer the role to DAM Management Committee

(viii) Issue new TC and / or revision of TCs for the promulgation of complementary policies on the implementation of DAS

(ix) Follow-up with CSWP on layer naming to address exchange of CSU data when the data is submitted in DGN format

(x) HPLB should accord priority to formulate the provisional DAS Organisation Structure and invite suitable representatives from PDs to take up the memberships of the Task Force and the DAM Management Committee, in particular for the appointment of the GIS Advisor (please see section 1.9.8) and the BPR Advisor. While other technical tasks are equally important, these management tasks should be well supported by policy with strong determination and partnering support from all PDs.

SAR

1.9.2 A Situation Analysis Review (SAR) is scheduled to be carried out in early 2006, subject to review, to evaluate the effectiveness, savings and benefits of the different measures in DAM.

1.9.3 The evaluation will also identify implementation considerations relating to the remaining DAF components to satisfy the overall DAS and resolve the remaining

problems not covered by the DAM (i.e. compare what has been implemented versus what is perceived to be pending – Standards component, etc.). This will help determine the scope, focus, priority and additional activities that need to be considered other than what this study has identified.

1.9.4 In the PLW Study, the below DAF Components were proposed:

(a) Data

(b) Metadata

(c) Catalogue

(d) Technology

(e) Standards, and

(f) Partnership

The framework is developed base on the National Spatial Data Infrastructure (NSDI) which was promulgated by the US Federal Geographic Data Committee (FGDC).

Migration from DAM to DAF

1.9.5 PLW Study recommended DAM as an interim solution prior to the long term solution DAF. It is worthwhile to re-consider the "interim nature" of DAM as the whole implementation of DAM will take more time than that suggested by the PLW Consultancy Study. The overhead incurred / to be incurred for this interim DAM is considerable, e.g. the interim solution for data dissemination of the five CSUs. The solutions and the overall implementation timeframe for DAM should be closely reviewed with the evolving initiatives from the B / Ds. These initiatives might further justify the migration from DAM to DAF or the offer of one-stop solution for non GIS users to view, query and analyze PLW data.

1.9.6 In the evolving technology environment, interoperable enterprise level spatial databases, GIS applications and web applications are available. That is, technology issue is not an obstacle. The ability to put in place shared IT infrastructure and technical resources (i.e. hardware, software, and staff) and determination to overcome institutional barriers (e.g. generate new culture on resources sharing) are the key issues and success factors. Adequate capital resources, human resources and institutional framework are all required and should be well collaborated to support the development of a common spatial Data Hub and Portal that could meet the day-to-day needs of the PDs.

1.9.7 To prepare for the migration to DAF, PDs currently working with antiquated, unsupported, or non-interoperable versions of GIS systems must be ready to transform their existing GIS platforms and make them compatible with the DAF. These GIS platforms should be upgraded to current-day interoperable versions. The users should be trained and be able to use the modern GIS effectively, taking advantages of many of their new productivity enhancing features.

1.9.8 For DAF purpose, requirements to meet the needs of all the other PDs will likely transcend the resources and institutional will of any one PD. It will need a strong and well represented, efficient and effective management framework to be responsible for the overall management. A GIS expert at the bureau level with practical implementation experience will play an important role and is an essential element to the long term success and formulating visionary yet pragmatic policies.

1.9.9 To be successful, such an agent must be chartered with a formal mandate to administer the Data Hub and Portal. This includes coordinating the installation, support, ongoing maintenance, and continuing upgrades of the DAF's intranet network hardware and software, enterprise-RDBMS, and interoperable GIS. The agent's (or Department's) budget needs to be appropriately sized. Its organizational structure must be sound, and the staff and leadership must be knowledgeable, experienced, and motivated. With all this in place, the most important key success factor would then be practical support of all key PDs involved in spatial data and map creation and use.

1.9.10 With the key issues of infrastructure, cultural change, budget, organization and staff resources resolved, the final key success factor would be proper placement and representation of appropriate expertise in the DAF Organisation structure and Implementation Team. With this in place, the management framework can assume a leadership role and successfully administer its responsibilities to implement the DAF.

2 Project Overview

2.1 Background

2.1.1 In recent years, significant progress has been made in both ETWB and HPLB departments, and also RVD and C&SD, in employing geographic information systems (GIS) in capturing, updating and analyzing geographic data. Some departments might have already implemented several GIS while at the same time there are quite a few GIS which are at different stages of development. These departments would need to exchange planning, lands and public works (PLW) data generated from their systems, including but not limited to the GIS system or from Computer Aided Drawing (CAD) system for planning, lands and works project purpose.

2.1.2 Despite the investments made on the GIS, there is room to improve the efficiency and effectiveness in the PLW data exchange processes which could include geospatial data, CAD drawings and textual data, either in digital or in hard copy format. The improvements are required to address deficiency arising from data alignment issues. These include data definition, data in digital format, compatibility of data format, data quality, data cost and turn around time.

2.1.3 Housing, Planning and Lands Bureau (HPLB) started an initiative to align the exchange of PLW Data among different participating departments in early 2000. On completion of Consultancy Study on the Alignment of Planning, Lands and Public Works Data (PLW Study) in January 2002, the Final Report of the PLW Study recommended a Data Alignment Strategy (DAS).

2.1.4 The Data Alignment Strategy (DAS) consists of two parts:

(a) Data Alignment Measures (DAMs) - These are near term measures recommended for providing quick relief within a time frame of about one year; and

(b) Data Alignment Framework (DAF) - The DAF is a long-term solution for a comprehensive data-sharing framework. The DAF vision is developed with reference to international best practices, including the key features in the spatial data infrastructures of leading countries on geographic information systems.

2.1.5 The Final Report of the PLW Study also recommended that DAM should be carried out with priority to address pressing data exchange problems common to the participating departments (PDs).

2.1.6 Azeus was awarded the contract to provide services to implement the six measures in DAM on 2 October 2002 and the project commenced on 16 October 2002. The objectives of the DAM project are to:

(a) Implement the DAM

(b) Carry out Situation Analysis Review. This includes a post implementation review for the DAMs and recommendation for DAM to DAF migration.

2.1.7 This project includes the following participating bureaux / departments:

(a) The participating departments (PDs) include ArchSD, CED, DSD, EMSD, HyD, TDD and WSD of ETWB; BD, LandsD, LR and PlanD of HPLB; C&SD, RVD of FSTB. They represent major stakeholders in the exchange of PLW data in the DAM initiative. ITSD was assigned to take up the role as a Technical Advisor which oversees the standard compliance in this DAM initiative.

(b) Participating Bureaux include HPLB and ETWB, whose roles are to implement joint e-Government initiatives with departments to improve effectiveness and efficiency. CITB is also a policy bureaux participating in this DAM initiative and their role is to align e-Government initiatives among B / Ds at HKSAR central government level.

2.2 Organization of Final Report

2.2.1 This Final Report presents the final solutions of each measure of DAM. The whole Final Report comprises 3 volumes:

Volume 1

(a) Section 1 is the Management Summary which gives a highlight of the final solution to each measure of DAM. It also gives a summary on cost, implementation schedule and advance tasks list that need to be followed up by the participating B / Ds.

(b) Section 2 gives the Project Overview. It illustrates the project background, organization of Final Report and current project status in the context of overall Data Alignment Strategy (DAS) for PLW Data.

(c) Section 3 is current environment description. It recaps the results of study from previous PLW Study and presents updated information in current environment.

(d) Section 4 is the final solution to DAM 1 – CSU. The section focuses on the concept and design of each CSU for DAM.

(e) Section 5 is the final solution to DAM 1 – CSU Implementation. The section focuses on implementation requirements, including data conversion requirements and data dissemination requirements.

(f) Section 6 is Programme of Adoption which describes the tasks required to perform for participating departments (PDs) to adopt to CSU based PLW Data exchange processes.

(g) Section 7 is the final solution to DAM 2 – Symbology.

(h) Section 8 is the final solution to DAM 3 – File Formats Standard.

(i) Section 9 is the final solution to DAM 5 and 6. This section presents the inventories of the metadata tools.

(j) Section 10 is the final solution to DAM 4 – Policy.

(k) Section 11 provides cost and benefit estimations on the implementation of DAM.

(l) Section 12 Implementation Schedule presents the recommended schedule for the implementation of each measure of DAM.

(m) Section 13 Way Forward illustrates the role of DAM within the overall DAS and makes suggestions on the direction of DAS after DAM's implementation.

Volume 2

2.2.2 Volume 2 comprises of the 9 Practice Notes:-

(a) Volume 2A - Specification and Explanatory Notes of Slope CSU

(b) Volume 2B - Specification and Explanatory Notes of Building CSU

(c) Volume 2C - Specification and Explanatory Notes of Lot CSU

(d) Volume 2D - Specification and Explanatory Notes of Road Centreline CSU

(e) Volume 2E - Specification and Explanatory Notes of TPU / SB CSU

(f) Volume 2F - Inventory of GIS Maps

(g) Volume 2G - Maintenance of File Formats Standard

(h) Volume 2H - Maintenance of Metadata

(i) Volume 2I - Data Custodianship and License Agreement.

Volume 3

2.2.3 Volume 3 comprises of 2 parts:-

(a) Volume 3A contains drafts of complementary policy documents, the policy documents include:-

(i) A new drafted Technical Circular.
The circular announces the implementation of the Data Alignment Strategy and the associated Data Alignment Measures (DAM) for the exchange of planning, lands and works data.

(ii) Revision to ETWB Technical Circular 16 / 2000

(iii) Revision to Project Administration Handbook

(b) Volume 3B contains the referred Appendices of Volume 1.

Overall Organization of Final Report

2.2.4 The below figure illustrates the organization of the Final Report:-

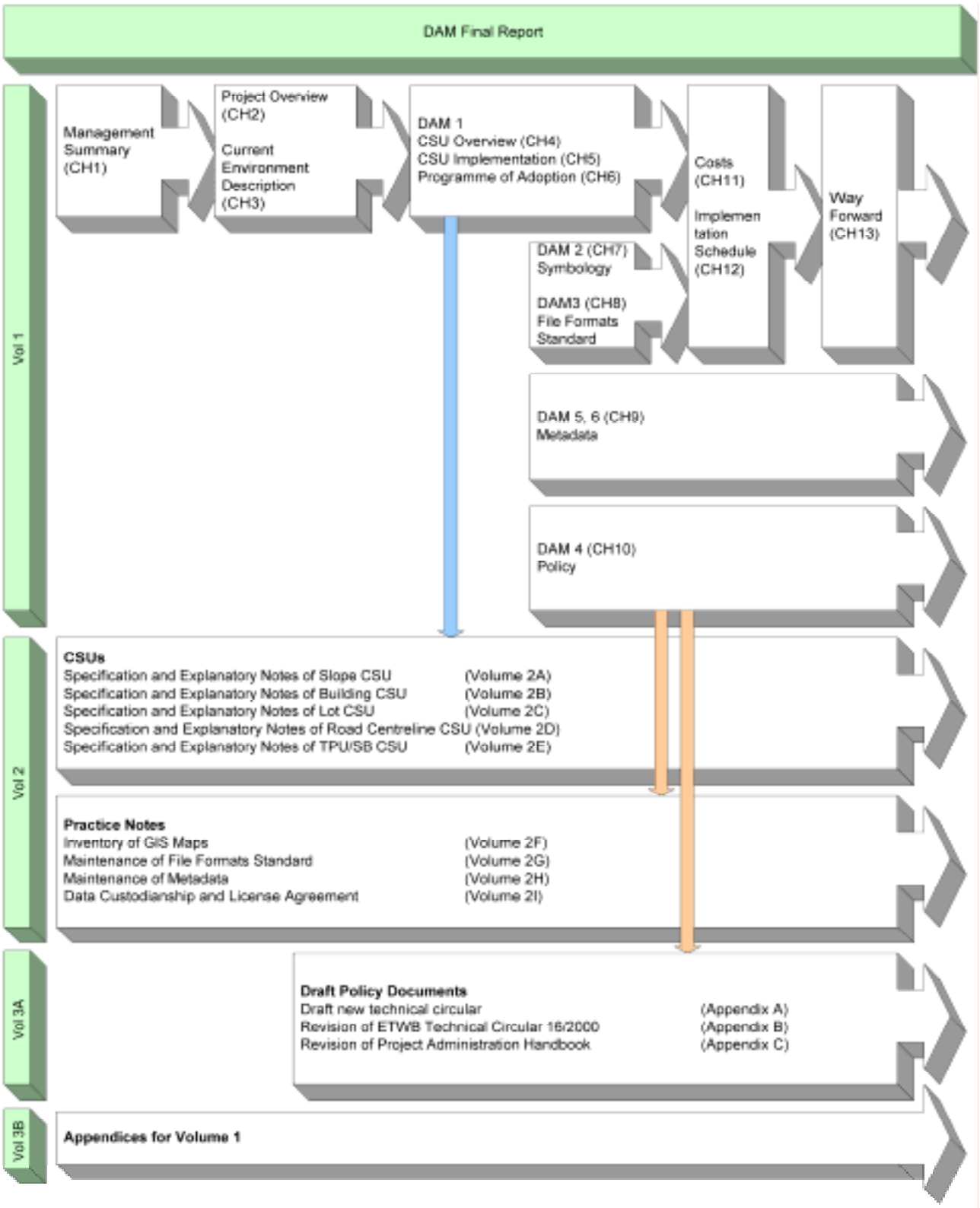


Figure 4 Organization of Final Report

2.3 Current Project Status

2.3.1 There are six measures included in the DAM and they are complementary to each other. Since the commencement of the project in October 2002, there were some changes reported in the current environment. With the approval of HPLB, the scope of the project has been adjusted accordingly and is summarized as below:

(a) DAM 1: Common Spatial Units (CSU) – to establish CSU's for solving the data definition problems. Five CSUs have been identified. They include Building, Lot, Road Centreline, Tertiary Planning Units / Street Blocks (TPU / SB) and Slope.

(b) DAM 2: Standardisation of symbology for graphic entities – to establish an inventory of GIS data containing the map style, map series, GIS platform details and the name of PD who maintains symbols specification. This information would be useful to other PDs in case when they want to reproduce the symbols for a specific purpose.

(c) DAM 3: Standards on the file formats for exchanging data – to streamline file conversion through standards on the file formats for exchange of data.

(d) DAM 4: Policy on exchange of data in electronic form – to formulate appropriate policy relating to the exchange of PLW Data.

(e) DAM 5: Metadata catalogue service – to leverage the facilities now available in LandsD and to enhance the LandsD metadata catalogue system to meet the requirements for the catalogue service of the metadata documentation of the PDs.

(f) DAM 6: Metadata production tools – to prepare an inventory report of metadata tools now being maintained by PDs.

2.3.2 Preliminary solutions of each measure of DAM were developed in July 2003. Since then, there had been more discussions on the technical details, implementation details and policy details. Final solutions of each measures of DAM have recently been agreed with all PDs.

2.3.3 The overall objective of the DAS initiative is complementary to the overall e-Government policy as stated in Digital 21 Strategy (http://www.info.gov.hk/digital21) promulgated by the Government of the Hong Kong Special Administrative Region. Despite the fact that DAMs are temporary measures which are to be implemented to improve the efficiency and effectiveness on exchange of PLW data, they actually form an interim milestone, which demonstrates the determination and capability of joint effort from B/Ds towards an e-Government policy. Of each measures in the DAMs, workable solution are recommended to facilitate B/Ds to collaborate to work together and demonstrate that Key Result Area 2 "To ensure that the Hong Kong Government leads by example" can be accomplished in the context of exchange of PLW data.

2.3.4 The data exchange processes documented in the Final Report of the PLW Study with relevance to the data alignment problems were reviewed. The recommended

solutions would be able to provide short-term measures to mitigate the problems as were originally discussed in the Final Report of the PLW Study.

2.3.5 On completion of the Final Report of DAM, according to the Project Brief, 12 months were allowed for PDs to complete some preparatory tasks prior to implementation of DAMs. These include:

(a) DAM 1, DAM 2 and DAM 3 - PDs shall apply funding and carry out system revamping, data conversion and data dissemination system's implementation.

(b) DAM 4 – Establish the Provisional DAS Organisation Structure, prepare and promulgate respective Practice Notes covering the specification and explanatory notes of the CSUs.

(c) DAM 5 and DAM 6 – Implement the Metadata Catalogue System and enforce the maintenance and submission of metadata from each individual PDs.

2.3.6 It is unlikely that the above tasks would be completed in 12 months. Given the lead time required for above preparatory tasks, the start date of the Situation Analysis Review should be changed to early 2006.

2.3.7 A diagram showing the different stages of the implementation of DAS is shown in Figure 5.

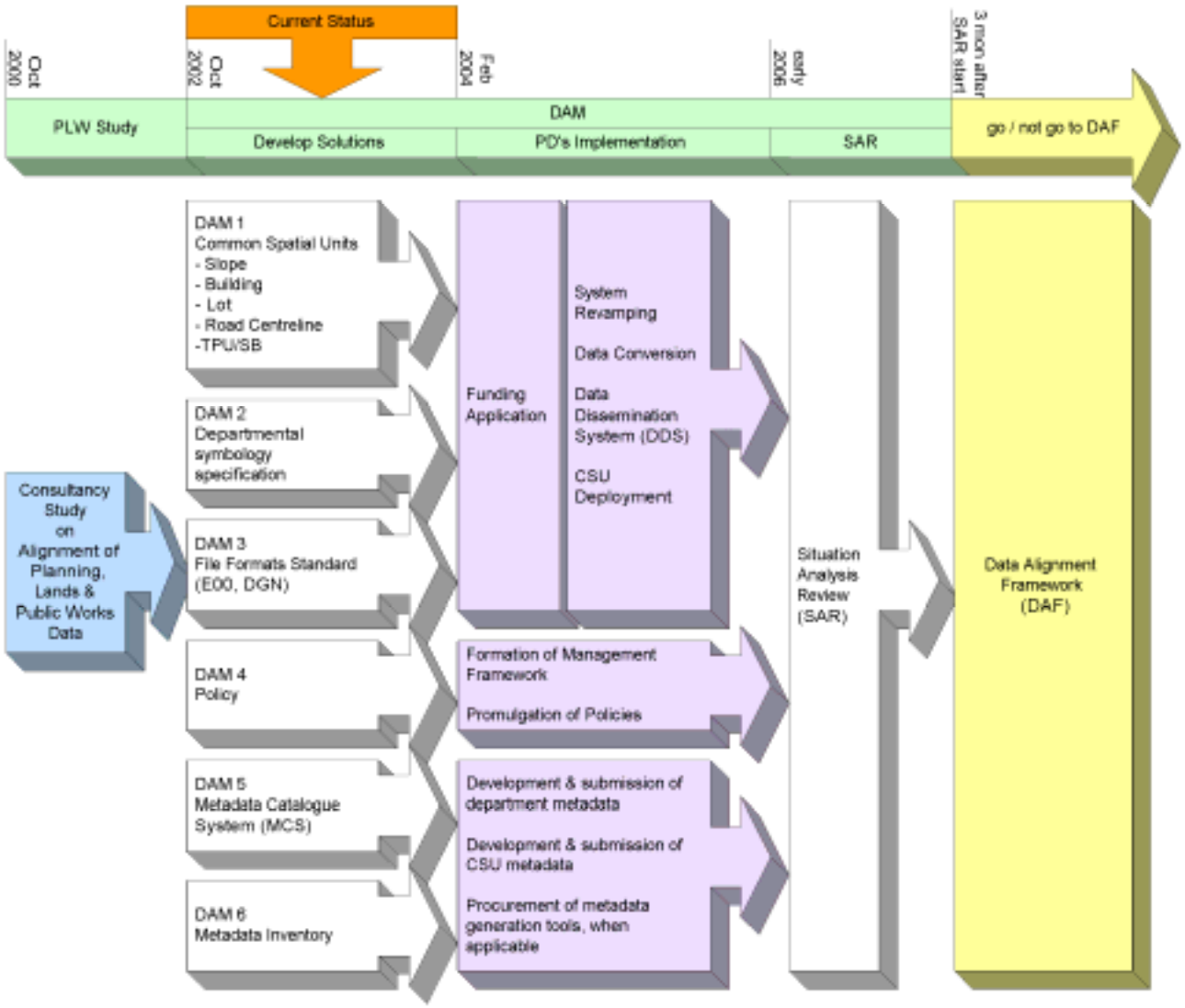


Figure 5 Stages of implementation of Data Alignment Strategy (DAS)

3 Current Environment Description

3.1 Data Inventory Classification

3.1.1 Stakeholders who have vested interests in the exchange of PLW data include PDs and non PDs (i.e. the departments who were involved in the PLW Study). These stakeholders have a vast inventory of PLW data. An inventory of PLW data owned or exchanged among these stakeholders was prepared. These data could be classified into different common PLW data entities. Normally, stakeholders require more than one data entity to meet the need from their core business. To present an overview of the inventory, the data entities had been classified into nine types[3] as depicted in the figure below.

(a) Building data, which are further divided into the following sub-types:

  (i) Data on individual or group of buildings;

  (ii) Data on units within buildings;

  (iii) Addresses which are information on the addresses of buildings or units;

(b) Land data, which includes land boundaries and land transaction documents;

(c) Planning data, which are further divided into the following sub-types:

  (i) Land use data, which includes data on existing and planned land use;

  (ii) Demographic data, which includes socio-economic data used for land use and infrastructure planning.

(d) Works project data, which includes data on public works project, in particular project layouts and as-constructed drawings;

(e) Mapping data, which includes the data on mapping products supplied by LandsD;

(f) Road data, which includes data on road traffic, geometry of the road network and various types of street furniture;

(g) Slope data, which includes technical information on slopes and information on maintenance responsibilities;

(h) Utility data, which includes data on existing and planned utility installations;

(i) Marine data, which includes information on marine facilities and marine dumping zones.

[3] From the PLW Study Final Report

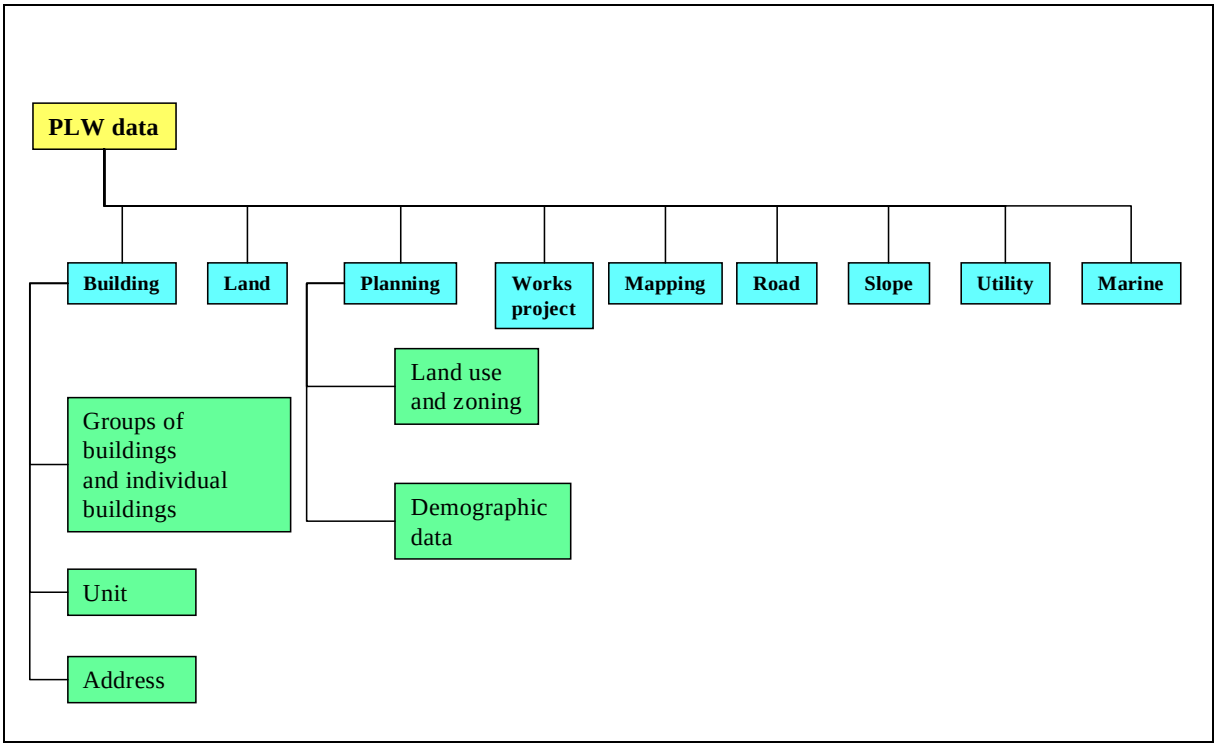


Figure 6 Classification of PLW Data

3.2 PLW Data Exchange Processes

3.2.1 In the PLW Study, it was said that there were about 170 data exchange processes between PD, Related Departments (RD) and Business Partners (BP). Among them, 70 processes are affected by various types of problems that require considerable labour cost (was estimated in the PLW Study to be about HK$8.7 million per year) on post processing. The implementation of DAMs targets to provide short-term measures in resolving the most pressing data exchange problems within a short time frame in a cost effective approach.

3.2.2 In the study of DAM project, the processes were reviewed and regrouped. There were about 250 processes identified in which 120 processes are DAM related. Full list of the studied processes is in Appendix K of Volume 3B.

4 DAM 1 - CSU

4.1 CSU List

4.1.1 In the previous PLW Study Report, six CSUs were identified: Slope, Building, Lot, TPU / SB, Road Centreline and Road Polygon.

4.1.2 The need for the above CSUs is further reviewed. It is concluded that Road Polygon will not be included in the CSU list. The reasons are:

(a) The Road Polygon, currently maintained by HyD, is mainly used to identify roads under HyD's maintenance jurisdiction. It would serve no direct use to other PDs.

(b) The spatial extent of the Road Polygon could vary considerably and within which the attribute data would be heterogeneous.

(c) Administration overhead and maintenance effort is required for a CSU, but such effort would not be justified due to its very limited use.

4.1.3 For Buildings, there had been suggestions to include other Subject Entities in the CSU, e.g. underground containments (e.g. underground car-park) and property units. Since underground containments information is of limited use to the PDs as a whole and also the PDs need to retain their own definitions of property units specific to each PDs' business needs, it is concluded that these suggested Subject Entities could be new CSU candidates for later consideration on implementation of DAM.

4.1.4 Except for the Road Polygon, the need for the other five CSUs is reaffirmed with the PDs. For the purpose of DAM implementation, the final CSU list consists of five entities:

(a) Slope CSU

(b) Building CSU

(c) Lot CSU

(d) Road Centreline CSU

(e) TPU / SB CSU

4.1.5 There is a business need to align the above five CSUs covering different business domains. Their scopes need to be managed such that they can be implemented within the jurisdiction of the PDs and within the committed time frames.

4.1.6 Sections 4.2 to 4.6 illustrate the current environment and business need of the CSUs covered in this project.

4.2 Slope CSU

Current Environment

4.2.1 There are about 500 new slope registration requests and 10,000 requests for updating slope information (requests from Works Department) received by CED

per year. There are also exchanges of Slope data among other PDs (e.g. LandsD and CED) for other purposes. They are:

(a) Registration of slopes under relevant technical circulars;

(b) Identification of the maintenance responsibility of apportioned area of each slope feature;

(c) Tracking the maintenance state of each slope feature under the maintenance jurisdiction of PDs.

4.2.2 The existing workflow that describes the process of data exchange is illustrated in Figure 7 and Figure 8 as below.

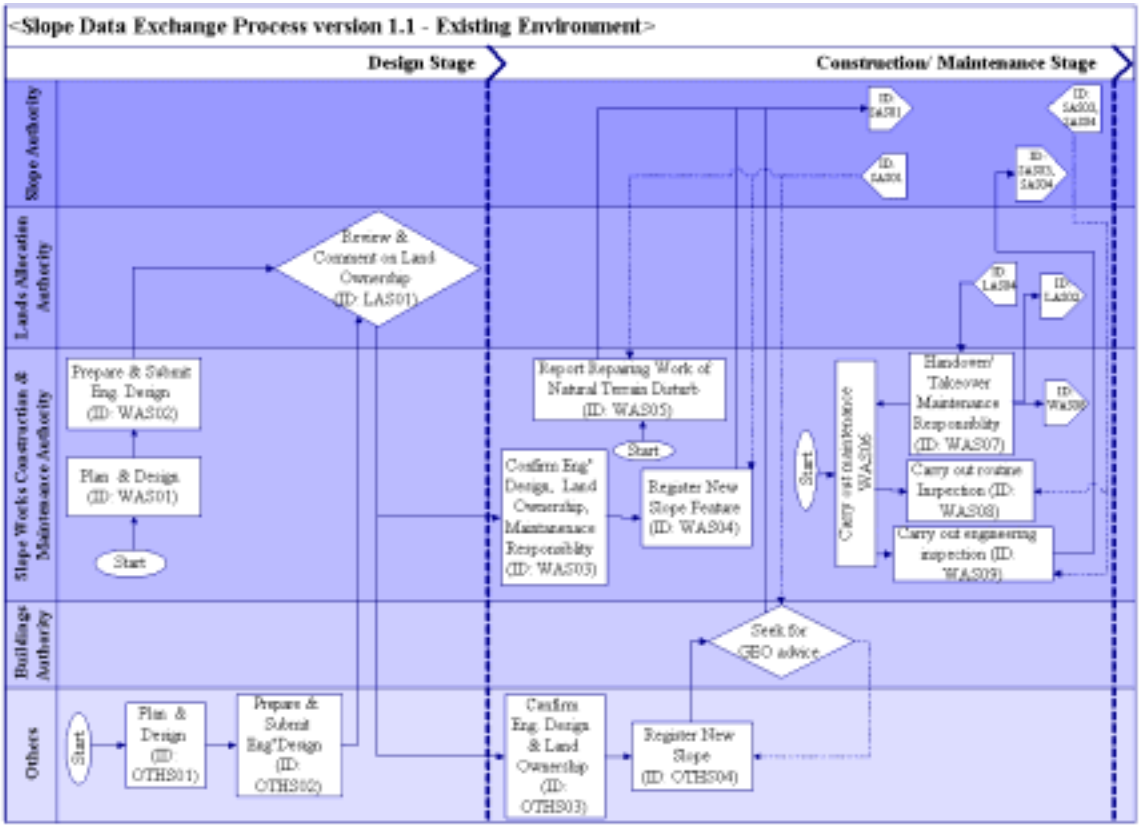


Figure 7 Existing Workflow in Design and Construction / Maintenance Stage

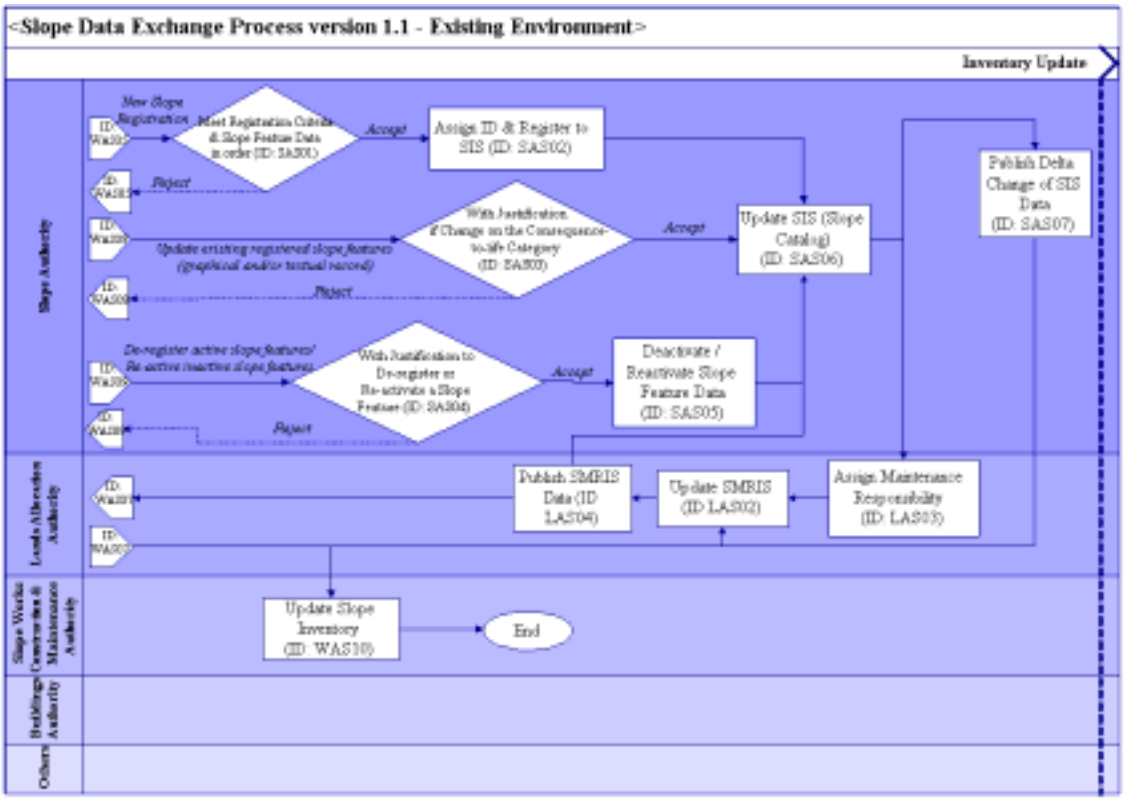


Figure 8 Existing Workflow in Inventory Update

Business need for the Slope CSU

4.2.3 The business definition of Slope CSU is not that much an issue since most PDs currently adopt the definition in WBTC No. 9/2000. (Slopes features are defined to include sizeable man-made slopes, retaining walls, disturbed terrain and natural terrain hazard mitigation measures located within HKSAR.) However, the current data exchange process of slope data involves a number of inefficient data exchange processes due to incompatible data file formats and disconnected workflow processes among the PDs.

4.2.4 The following inefficiencies would need to be addressed in Slope CSU:

(a) The Works Departments are required to submit the slope formation data to CED for registration in accordance with WBTC No. 9/2000. CED has been spending tremendous efforts in digitizing the slope plans, verifying the information and manually entering the information into the Slope Information System. Despite some PDs, (e.g. HyD) would submit the slope information in softcopy format, CED is still required to manually process the information due to the data definition problem.

(b) PDs would need to collect the slope feature information and maintenance responsibility information from CED and LandsD respectively. There is risk of data discrepancy and it would be more effective if consolidated data could come from a single source. Currently, there is lack of version

references between LandsD's slope maintenance responsibility information and CED 's slope feature information. In case there were data discrepancy found (e.g. the slope feature no long exists in CED's dataset, but maintenance responsibility for that particular slope is still assigned to a PD in LandsD's dataset), it would not be easy to spot the data mismatch problem nor to explain why there is a data mismatch. Thus, the affected PD (Data Users) will have to clarify with CED, who then has to further check with LandsD.

(c) Inconsistency can be found occasionally between the spatial and textual attributes of CED's slope feature information as they are updated and maintained by two different divisions of CED. In the current environment, PDs, who need to use such data to update their inventories, have to fix this problem by themselves.

4.3 Building CSU

Current Environment

4.3.1 There are currently about 92,000 building blocks information maintained in BD's record. The record includes all private buildings and New Territories Exempted House (NTEH) under jurisdiction of Buildings Ordinance and buildings under Private Sector Participation Scheme (PSPS) of HA.

4.3.2 Building information is core to the business of the departments of HPLB and such information would be required for the works projects of works departments of ETWB. This information is not limited to the information now being maintained by BD. B/Ds would also require information about non-private buildings, including government buildings (the ownership and building works maintenance responsibility would go to various departments), public housing estates and Home Ownership Scheme (other than PSPS) of HA, other huts on government land and other unauthorized building works on private land.

4.3.3 Among the PDs, BD, LandsD, RVD, PlanD, ArchSD are major stakeholders who need to maintain the building information to support their core businesses. There are other non-PDs who also have the need to maintain building information to support normal operation of their core business, e.g. HD and GPA (Government Property Agency). The requirements from the non-PDs, in the context of the Building CSU, would not be included in this project.

4.3.4 Example of building information required by the PDs include:

(a) Spatial building records (from LandsD);

(b) Approved building plans information (e.g. GFA) and issued Occupation Permit (from BD);

(c) Building address location reference (from RVD);

4.3.5 PDs require building information for different purposes, they include:

(a) Maintenance of a geo-referenced topographical map;

(b) Assessment of government rent and rating valuation;

(c) Projection of 5-year property supply;

(d) Projection of population distribution, planning for provision of infrastructure to support the population growth and alignment of jurisdiction boundary for district administration purpose;

(e) Spatial analysis, e.g. Establish 3D building models for analysis (e.g. visual impact analysis, air pollutant model analysis);

(f) Enforcement of the Buildings Ordinance.

4.3.6 The existing workflow that describes the process of data exchange is illustrated in Figure 9 to Figure 13 as below.

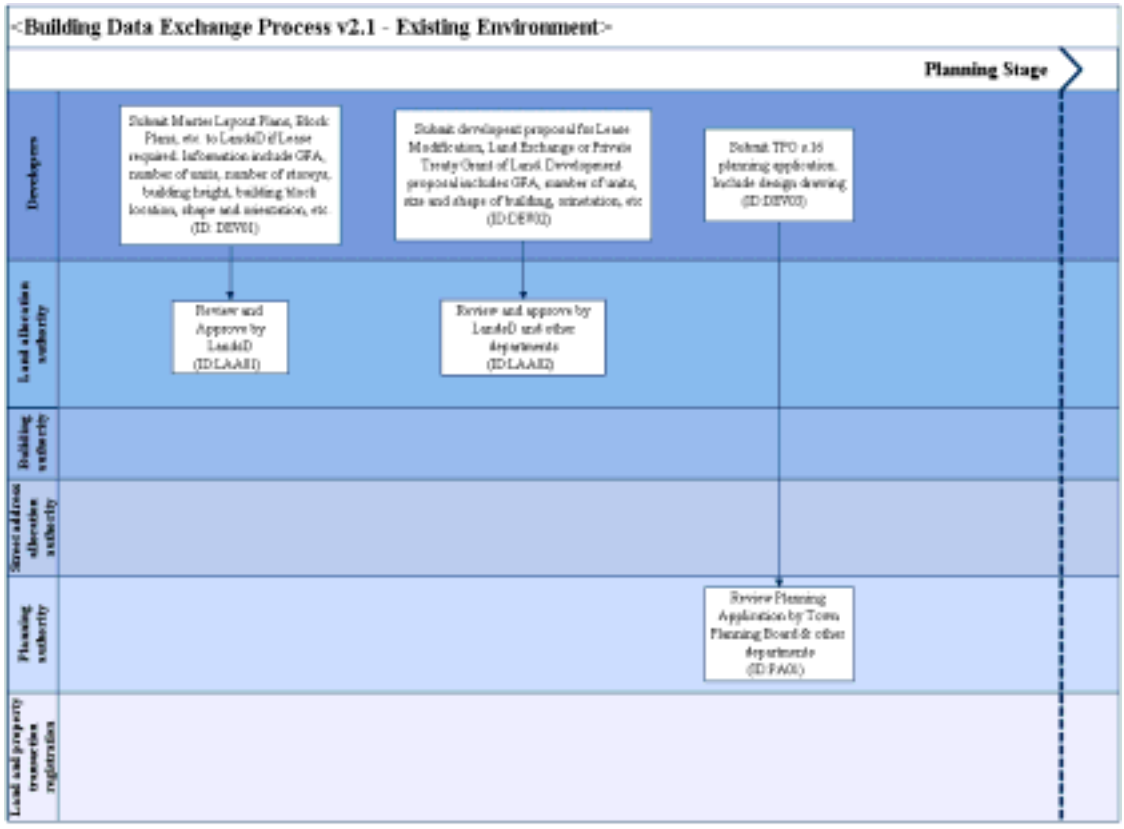


Figure 9 Existing Workflow in Planning Stage

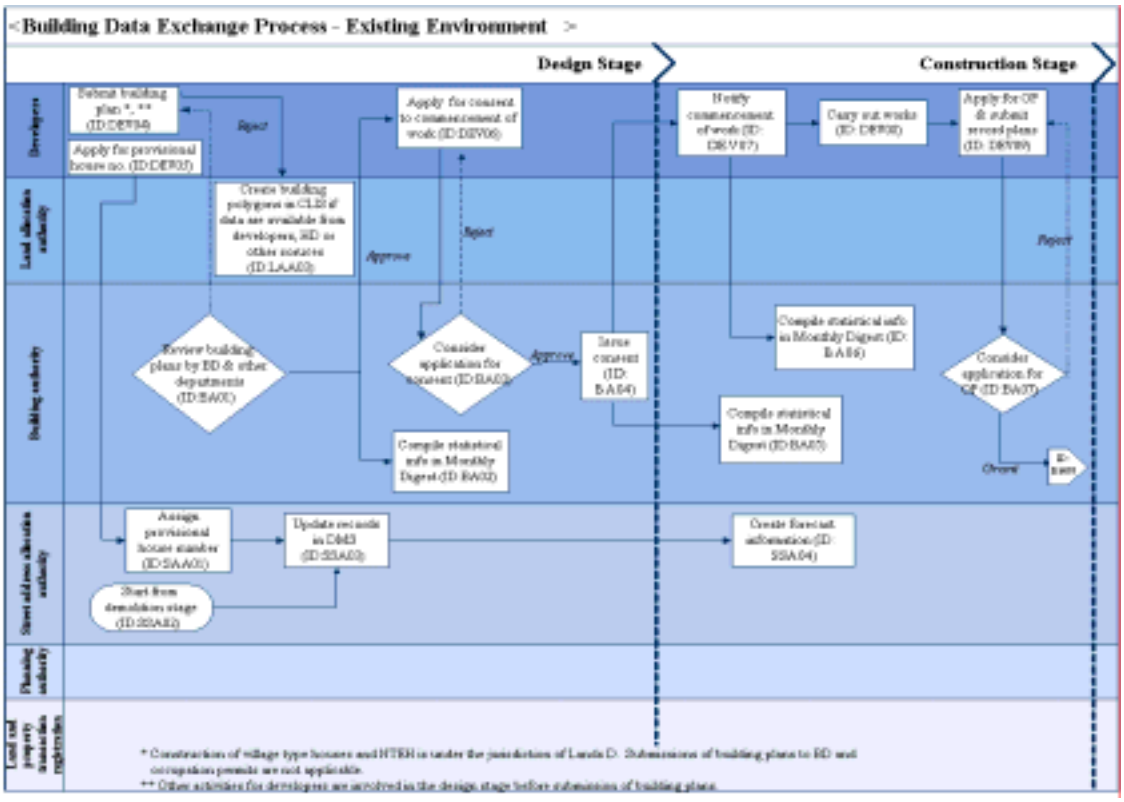


Figure 10 Existing Workflow in Design and Construction Stage

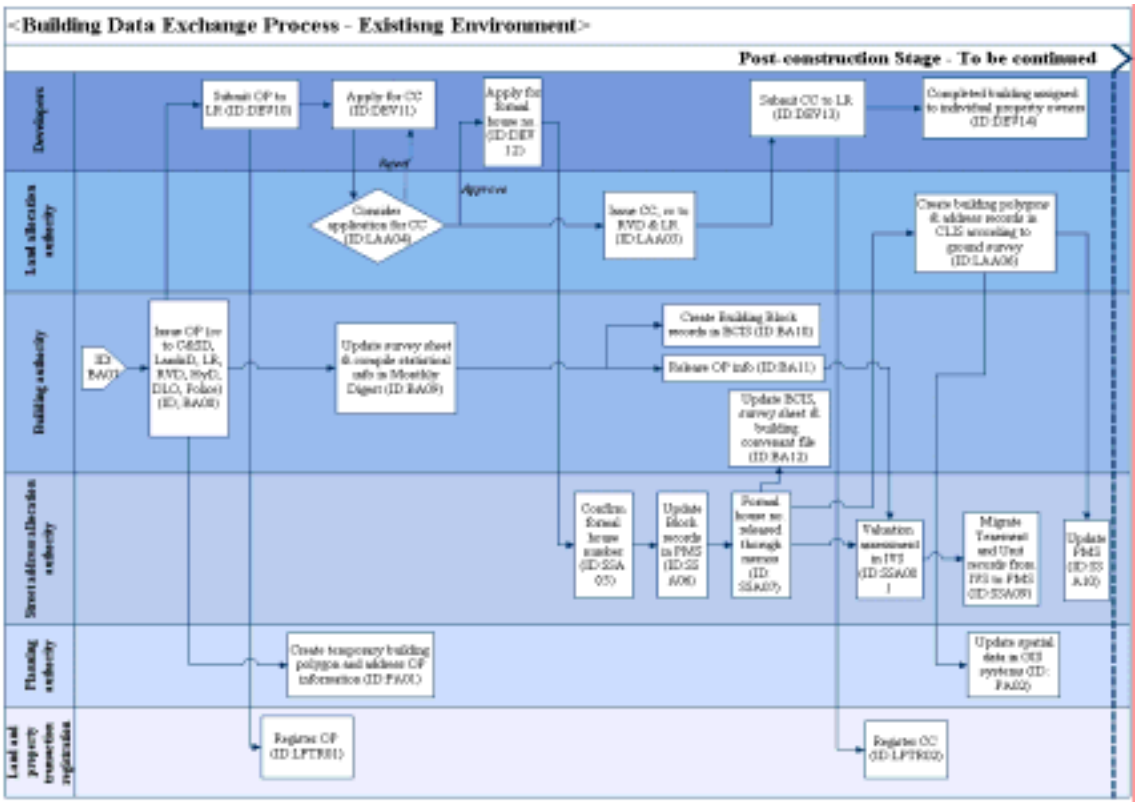


Figure 11 Existing Workflow in Post Construction Stage (I)

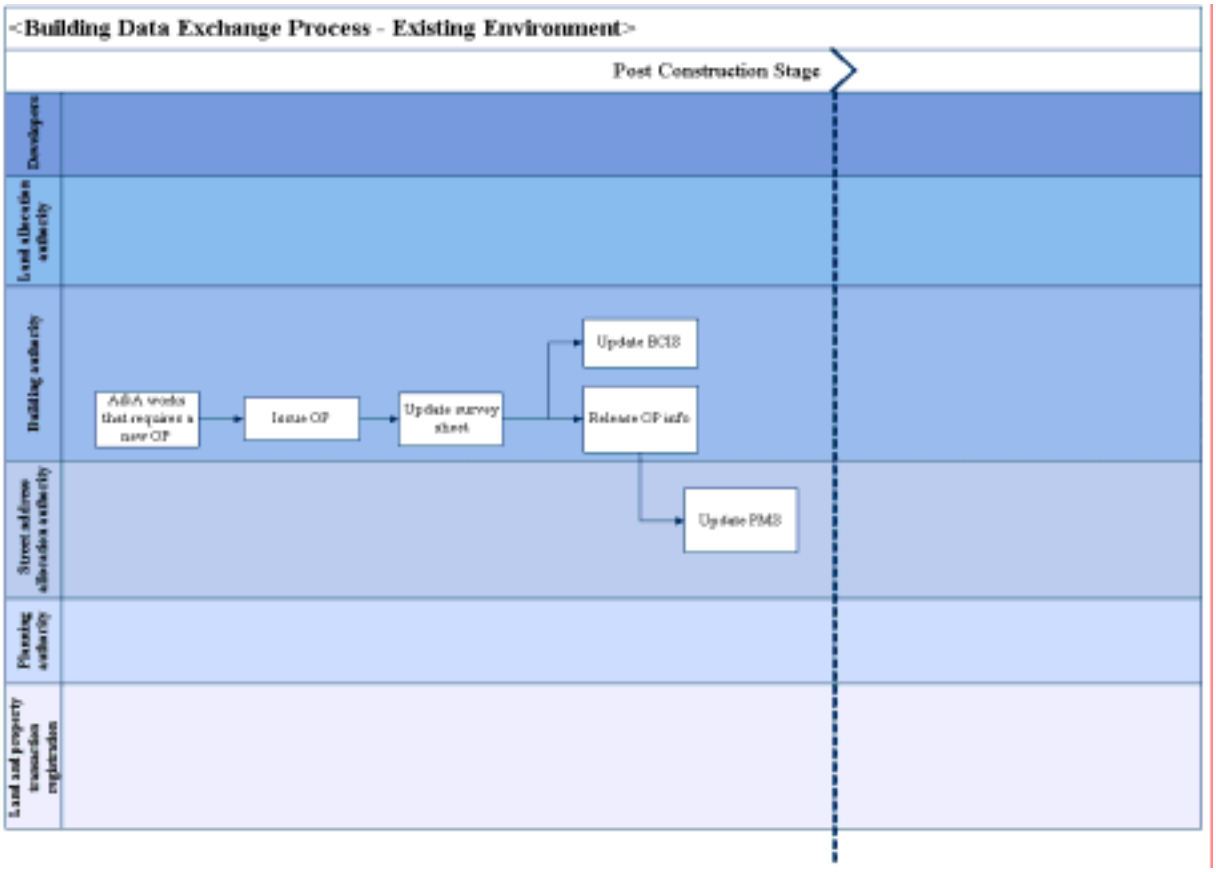


Figure 12 Existing Workflow in Post-Construction Stage (II)

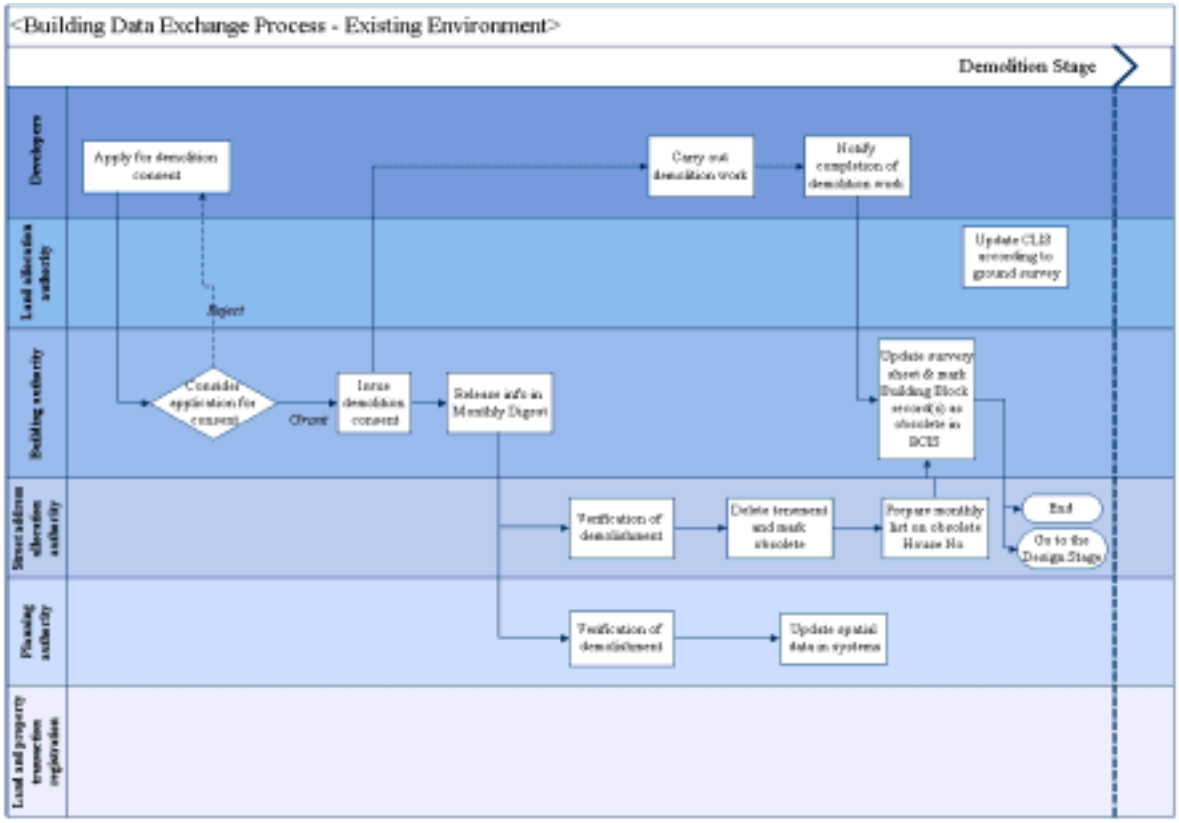


Figure 13 Existing Workflow in Demolition Stage

Business need for the Building CSU

4.3.7 There is a genuine need to align the different Building definitions currently adopted by PDs to meet each of their specific business needs. The physical meaning of buildings could mean to include building tower and / or podiums. The following examples illustrate the alignment issue due to inconsistent data definition of building towers adopted by some PDs:

(a) LandsD defines buildings as permanent building or structure of a size larger than $10m^2$ according to Basic Mapping Specification.

(b) RVD defines buildings as ratable boundaries.

(c) BD defines buildings as attached structures sharing the same Means Of Escape (MOE).

(d) C&SD defines building as an independent structure, permanent or temporary, covered by a roof and enclosed by external walls extending from the foundation to the roof. It includes structure less than $10m^2$.

(e) PlanD's definition of building aligns with that of LandsD's.

(f) LR defines building as residential or commercial dwelling(s) belonging to one or more owner committee.

4.3.8 PDs have been spending great effort to integrate building related data from different departments to the data format conforming to their departmental business definition. These efforts could have been better coordinated since some PDs are repeating the same conversion process by themselves.

4.3.9 In addition to the above, it was agreed with members of the sub working group that there is a need to improve the following processes on implementation of Building CSU:

(a) Most PDs would require the podium information as spatial polygons. However, since only podium line information is currently available from LandsD, these PDs would have to close the podium lines to form the polygons by themselves. Instead of repeating the exercise by each PD, the effort would be coordinated in the revised workflow and a mechanism would be designed for the updating of the Building CSU information throughout the life cycle of the Building CSU.

(b) The current workflow in the exchange of building information could only allow the building information to be made available at a very late stage, e.g. after issuing Occupation Permits. To meet the business need, individual PDs would have to approach developers / architects or relevant departments for the building information in the early stage of the building development. Instead of repeating the exercise by each PD, the effort would be coordinated in the revised workflow and a mechanism would be

designed for the updating of the Building CSU information throughout the life cycle of the Building CSU.

4.4 Lot CSU

Current Environment

4.4.1 It is stipulated in the Land Survey Ordinance (1995) that for every subdivision of land, a land boundary plan prepared and certified by an Authorized Land Surveyor is required for land registration. The Authorized Land Surveyor is required to submit a copy of the land boundary plan within 7 days with the Land Survey Authority for the establishment of land boundary records after the deed and related documents of the lot subdivision had been delivered to the Land Registry for registration. Almost all new lots granted in recent years have boundaries with defined coordinates.

4.4.2 There were 11,763 and 2,455 new Lot Registers created in LR's Land Registration System (LRS) in year 2001 and 2002 respectively.

4.4.3 Among the PDs, BD, LandsD, PlanD, RVD, LR are major stakeholders in maintaining lot information. LandsD and LR are the authorities responsible for providing the digitized land administration and statutory lot registers information respectively. These information would be useful to other PDs to support the core business of their departments:

(a) Land Registration - LR is the registrar responsible to perform the land registration process and record all legal documents related to land transaction, e.g. property / ownership particulars, encumbrances, references, and particulars of registered memorials, and grant conditions. LR will include the lot transaction information on the Memorial Day Book, which will be distributed to PDs on a daily basis.

(b) Land Administration – LandsD is the land authority responsible for administering land issues in Hong Kong. Different divisions / offices of LandsD, such as Land Administration Offices (LAO), Survey and Mapping Office (SMO), District Survey Offices (DSO), will act on behalf of LandsD and exchange land lot data with PDs. LAO is to acquire and make land available for Government's development programs. It is responsible for land disposal, including land sale programme, lease modification, surrender and regrant, and granting of the short-term tenancy. Works Departments would need to liaise with LAO and exchange lot information for land resumption or other purposes for the implementation of the public works projects.

(c) Land Boundary Preparation and Distribution - SMO is responsible for the establishment and maintenance of geodetic network, topographic survey and provision of land boundary (cadastral) surveys. DSO, on the other hand, deals with land boundary plan preparation, land boundary survey,

land status enquires and the provision of other survey and mapping support to different Government departments.

(d) As a referencing unit for development site and building – RVD collects the land grant document, resumption plan, and cadastral map to maintain their survey record plan and sales record plan. Furthermore, the land lot data also serves as miscellaneous address reference to support BD's and RVD's businesses.

(e) Property Forecast - RVD requires Lot CSU information for property forecasts which are usually carried out at half-yearly intervals.

(f) Occupation Permit (OP) application and other businesses under the Buildings Ordinance - BD requires information about the Lots for processing OP applications, lot clarification cases and other businesses in relation to administration, control and enforcement of the Buildings Ordinance.

4.4.4 The existing workflow that describes the process of data exchange is illustrated in Figure 14 to Figure 16 as below.

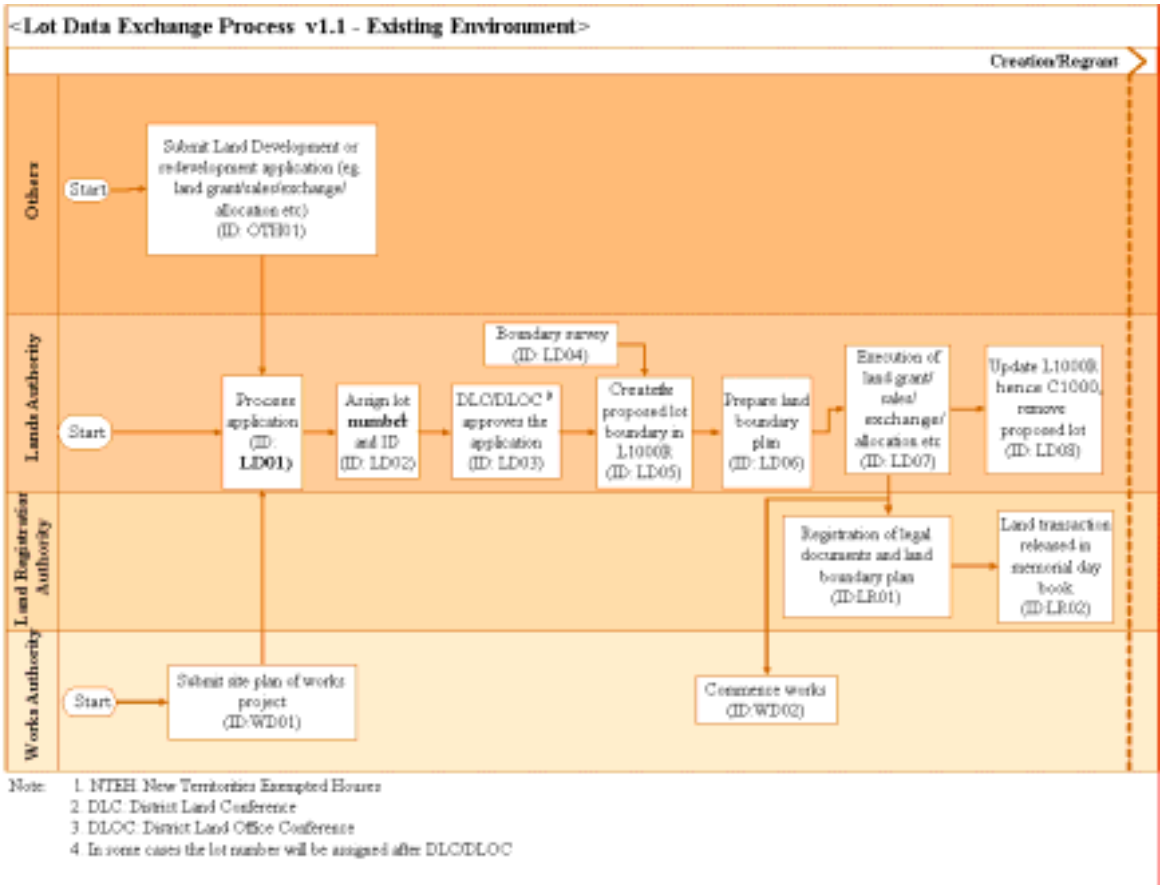


Figure 14 Existing Workflow of Lot in Creation and Regrant Stage

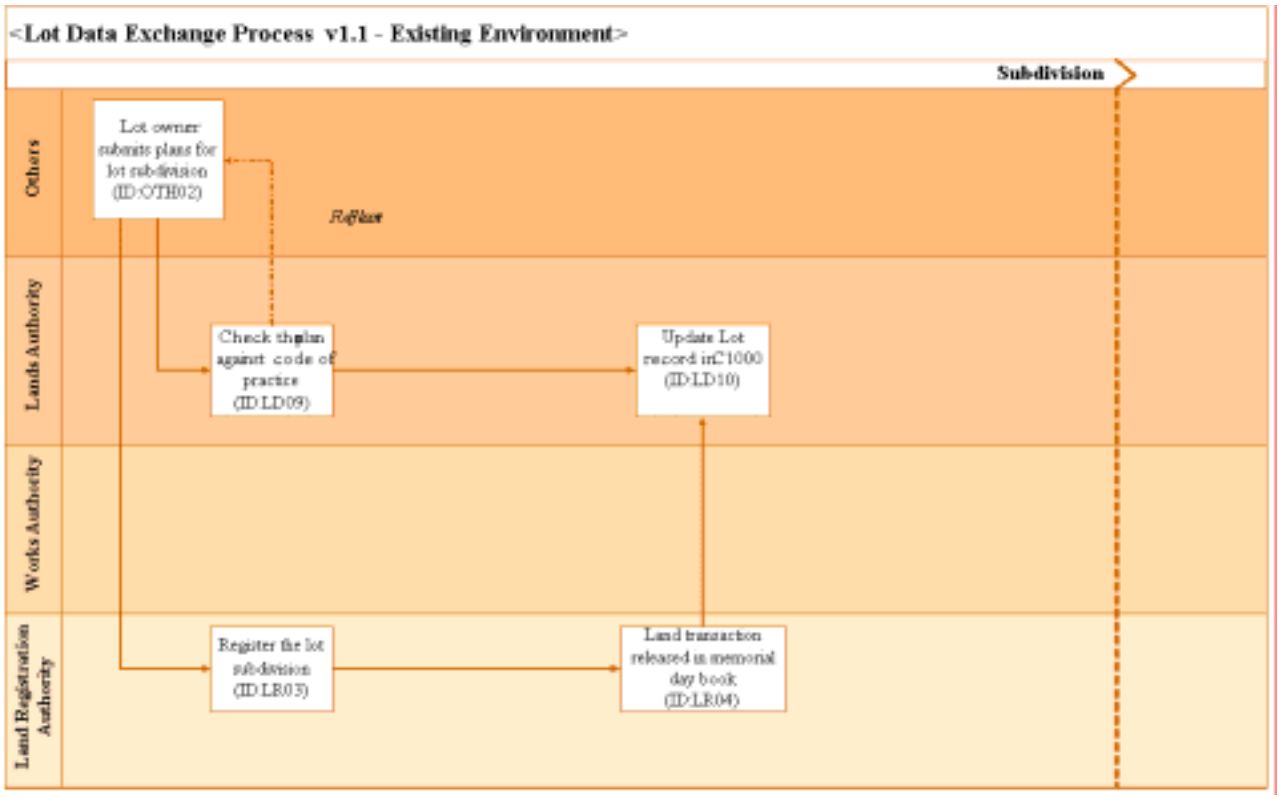


Figure 15 Existing Workflow of Lot in Subdivision Stage

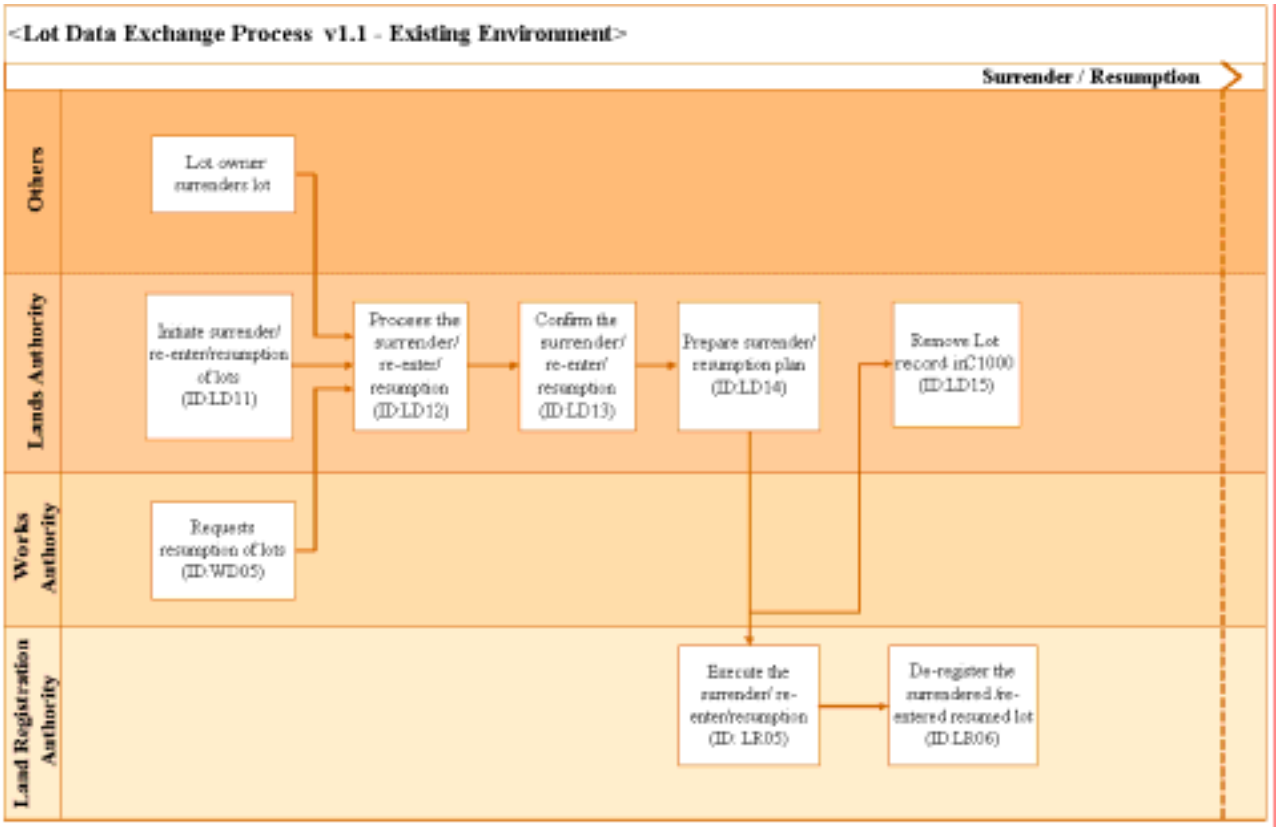


Figure 16 Existing Workflow of Lot in Surrender/Resumption Stage

Business need for the Lot CSU

4.4.5 There is a genuine need to align the lot description. Currently, BD, LandsD, RVD and LR have their own department conventions for the lots description. BD, RVD and LR have predefined fields to store the lot type, lot number, sections, subsections and extensions in a structured manner, whereas LandsD uses a comma delimited format to handle virtually unlimited number of sections / subsections, R.P. and extensions.

4.4.6 To better facilitate data exchanged between PDs, the Lot CSU sub-working group considered that it would be beneficial to PDs to maintain a 1-1 mapping between the conventions used by the two major stakeholders, namely LandsD and LR - by building and maintaining a one-one mapping table between LandsD's representation of Lot No. (as published in the C1000 library) and LR's representation (PRN as in IRIS and the structural format currently used in LRS).

4.5 Road Centreline CSU

Current Environment

4.5.1 A majority of the road network is managed, operated and maintained by HyD. There is a small percentage of the road network maintained by PDs (e.g. WSD, DSD etc) while at the same time, there are some roads maintained by non-PDs (e.g. HA), franchised road operators (e.g. Route 3 Operator) and private developers.

4.5.2 Street name needs to be gazetted by LandsD prior to being adopted for public use. The designated authority for street naming was transferred to LandsD with effect from 27 January 2000. The Survey and Mapping Office (SMO) is responsible for organizing and coordinating the naming of streets and roads and the processing of the gazetting of the names.

4.5.3 The procedures and guidelines on street naming are stipulated in SMO QMS document SMWI-TEC-0057 "Street Naming".

4.5.4 When there is a major alignment change due to road planning or redevelopment, the changes would be gazetted. When a street no longer exists due to road works or redevelopment, the deletion of the street name would be gazetted.

4.5.5 In physical terms, a road is the whole or part of any highway, street, lane, footpath, square or passage. As roads and streets are used interchangeably amongst the PDs, therefore, in this document, the two terms are synonymous. In legal terms, a street in accordance with the Public Health and Municipal Services Ordinance Section 111A is given as follows:-

(a) A "private street" means a street on land held under Government lease, license or otherwise from the Government or on land over which the Government has granted or reserved a right of way;

(b) A “street” includes a private street and any area of land declared to be a street by the Director of Highways Department.

4.5.6 Among the PDs, HyD is one of the major stakeholders who need to maintain the road data to support the operation and management of their core business. There are other non-PDs who also need to maintain road data to support the operation of their core business, e.g. FSD and TD. The requirements of the non-PDs, in the context of the Road Centreline CSU, would not be included in the project.

4.5.7 In relation to Road Centreline CSU, HyD is also maintaining its Road Polygon which is a departmental spatial entity defining the polygons of the road network under the maintenance jurisdiction of HyD. These polygon information are currently used in the Utility Management System, which is a HyD system for administering road opening application records in GIS and database forms.

4.5.8 PDs would require road centreline information for different purposes:

(a) Confirm the location, the street name and street types for reference by projects and / or services now being offered by other PDs.

(b) Communicate with other PDs for planning, operation, and management of the road network.

(c) Form a backdrop in the GIS map.

4.5.9 The existing workflow that describes the process of data exchange of road centreline information is illustrated in Figure 17 below.

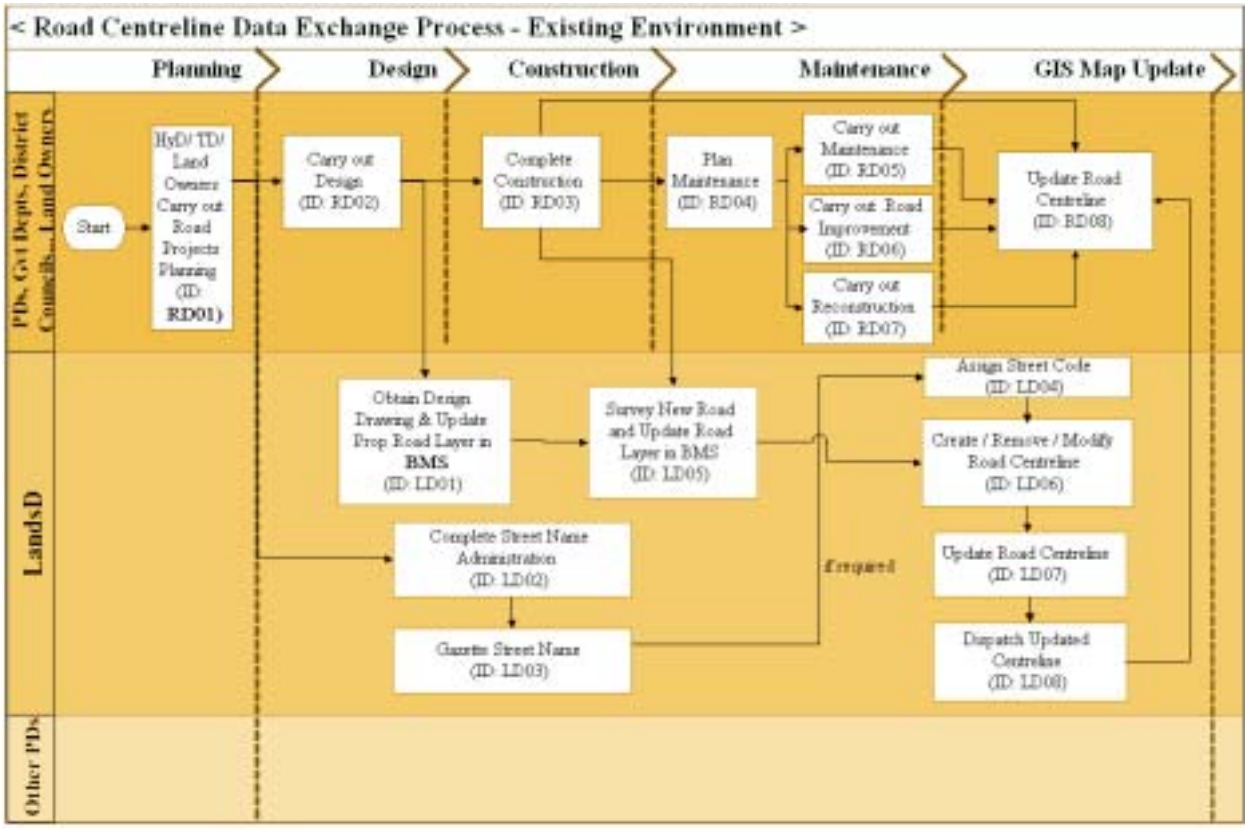


Figure 17 Existing Workflow in the exchange of Road Centreline Entity data

Business need for the Road Centreline CSU

4.5.10 PDs and other organizations are currently using LandsD's single road centreline for geo-referencing and planning purposes, e.g. PlanD, FSD.

4.5.11 There are limitations from the current single road centreline system which do not fully satisfy other departments' needs, e.g. not able to support route planning due to the absence of turntable, road direction information etc. Currently some non PDs (e.g. TD) who are also stakeholders in the road centreline have been developing own road centreline model. These efforts could be coordinated. However, the TD's road centreline model together with associated turntable under its Transport Information System (TIS) will not be made available within the DAM timeframe.

4.5.12 Despite the fact, it is recommended to adopt LandsD's single road centreline as the Road Centreline CSU, and when required, a new CSU can be created to accommodate the future TD's multiple road centreline, which is more suitable for route planning purpose.

4.5.13 In the context of the Road Centreline CSU and since there is need for LandsD to continue the maintenance of the existing single road centreline for other non PDs, it was agreed by the sub-working group that any change required for the Road Centerline CSU should be kept to a minimum, so that effect to the non PDs would

be reduced. Also effort put in the system revamping for CSU purpose would be better within the affordability of LandsD.

4.6 TPU/SB CSU

Current Environment

4.6.1 The Tertiary Planning Unit (TPU) is a geographic reference system demarcated by Planning Department for the Territory of Hong Kong. The Street Block (SB) is a smaller planning unit in the TPU. Both the TPU and SB boundaries provide a common geographic system for the compilation of statistical data. Users can incorporate the statistical data into their own GIS on the basis of the TPU and SB boundaries.

4.6.2 PDs need to exchange TPU / SB data for different purposes:

(a) A government established geo-spatial unit which could be commonly referenced for the compilation of statistical data such as population and employment information to meet with long-term planning;

(b) A common geographical unit for referencing purposes, e.g. development site can be referred by SB unit;

(c) As a reference boundary for the delineation of administrative boundaries e.g. District Council Constituency Area (DCCA) map.

4.6.3 In the context of TPU / SB data, the existing workflow that describes the process of data exchange can be divided into two stages: Preparation and Issuance. Workflows in these two stages are illustrated in Figure 18 and Figure 19 respectively.

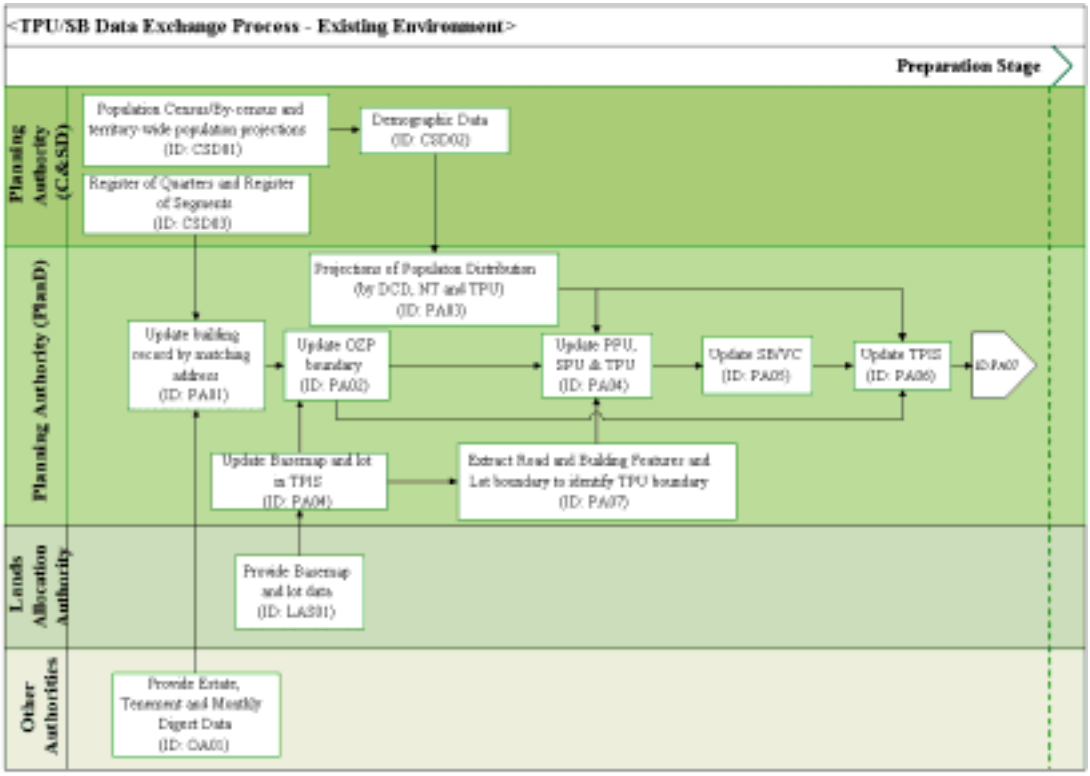


Figure 18 – Existing Workflow of TPU/SB in Preparation Stage

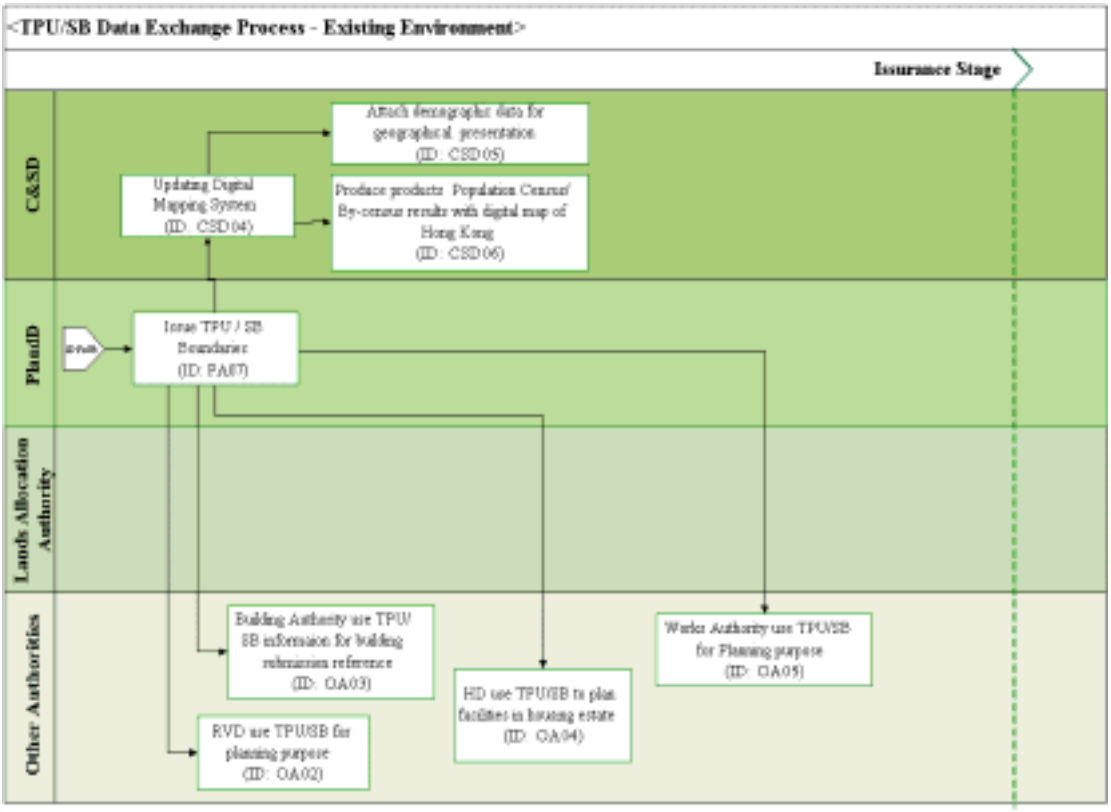


Figure 19 – Existing Workflow of TPU/SB in Issuance Stage

Business need for the TPU/SB CSU

4.6.4 The TPU / SB data exchange processes are mainly one-way, that is, from PlanD to other PDs. The TPU / SB CSU would be streamlined in the future workflow in terms of integration and provision of projected populations by TPU. Instead of having each PD to request the projected population data from the Working Group on Population Distribution (WGPD) and integrating these data with TPU / SB data individually, under CSU environment, PDs could obtain this information directly from the TPU / SB CSU.

4.7 CSU Specification

4.7.1 The Final Solution to DAM 1 comprises a set of specification and explanatory notes for each of the 5 CSUs. The specification covers:

(a) CSU Definition – includes scope, common rules for delineation and shapes of polygons / lines, common attributes, CSU ID and data custodianship

(b) Revise Workflow on implementation of CSU

(c) CSU Data Interface Requirements – includes CSU Status, Themes, Logical Data Structure and Entity Description

(d) Maintenance of CSU – includes data provision frequency, data dissemination frequency and mode of dissemination

CSU Definition

4.7.2 It is crucial that in the CSU definition:

(a) The CSU scope is manageable within the committed timeframe and the business definitions shall be aligned with all stakeholders PDs. For example, LandsD defines building as a permanent building or structure with a size larger than $10m^2$ (according to Basic Mapping Specification); RVD defines a building as rateable boundaries; BD defines buildings as attached structures sharing the same Means Of Escape (MOE). These business definitions need to be aligned together with the delineation rules (spatial delineation rules) of each respective CSU.

(b) The common rules for delineation and shapes of polygons should be consistent with the aligned business definitions of the CSUs and meet the business requirements of the PDs

(c) Every attributes of the CSU should be well defined with respect to its physical meaning, accuracy and the need priority (i.e. if it is a mandatory attribute or optional attribute)

(d) Each CSU shall be represented by a CSU ID which is a unique and persistent identifier. PDs, in particular the Data Agent should also review the technical feasibility of such CSU ID system and the impact to their existing systems.

(e) Among each attribute of the CSU, it is essential that the data custodianship of each attribute should be well defined and is under the jurisdiction of the 13 PDs. The following table summarises the role of PDs in the data custodianship of the five CSUs. Details of the responsibilities of the Data Agent, Data Owner and Data User would be discussed in Volume 3A of this report.

PDs	**CSU**				
	Slope	**Building**	**Lot**	**Road Centreline**	**TPU/SB**
ArchSD	Data Owner, Data User	Data Owner			
BD	Data User	Data Owner, Data User	Data User		Data User
C&SD		Data User			Data User
CED	Data Agent, Data Owner, Data User		Data User	Data User	
DSD	Data Owner, Data User		Data User	Data User	Data User
EMSD					
HyD	Data Owner, Data User			Data User	
LandsD	Data Owner, Data User	Data Agent, Data Owner, Data User	Data Agent, Data Owner, Data User	Data Agent, Data Owner, Data User	Data User
LR			Data Owner		
PlanD		Data Owner, Data User	Data User	Data User	Data Owner, Data Agent, Data User
RVD		Data Owner, Data User	Data User		Data User
TDD	Data Owner				Data User

WSD	Data Owner, Data User				

Table 3 – Roles of PDs in the data custodianship of the 5 CSUs

Revised Workflow

4.7.3 A revised workflow shall demonstrate for each CSU the new process or procedures on implementation of DAM. This revised workflow could be further improved should there are seen any inefficient processes on implementation of CSU. These inefficient processes should have been improved / removed from the revised workflows. If there are areas good for process reengineering on implementation of CSU, PDs could bring this up to the DAM Management Committee. Responsibilities of DAM Management Committee would be covered in draft Technical Circular (please refer to Volume 3A).

CSU data interface requirement

4.7.4 A logical model for CSU data exchange is defined for PDs' exchange of the each CSU. It describes the logical structure of CSU data exchanged between the interfacing systems of PDs. PDs, as either Data Owners or Data Users, are not required to adopt the same logical data structure in their own departmental systems. However, each PD is recommended to maintain a mapping between the Common Spatial Units and their departmental records in their respective core departmental systems.

Maintenance of the CSU

4.7.5 The maintenance would mean the data provision frequency, data dissemination frequency and mode of dissemination for each CSU.

4.7.6 Details of the covered will be documented in the following CSU Specification and Explanatory Notes:

Volume	CSU Specification and Explanatory Notes	Contents
2A	Slope	CSU Definition Revised Workflow CSU Data Interface Requirement Maintenance of the CSU
2B	Building	
2C	Lot	
2D	Road Centreline	
2E	TPU / SB	

Table 4 List of CSU Specification

5 DAM 1 - CSU Implementation

5.1 Data Conversion

Overview

5.1.1 An one-off data conversion exercise is required to consolidate the relevant data currently maintained by PDs and to establish an initial dataset of each CSU prior to the implementation of the future CSUs' workflows:

(a) The respective data providers (a data provider would mean a PD who is maintaining some data relevant to the CSU definition and as an one offer arrangement, they offer to convert these existing data to the defined CSU data structure to form the first batch of CSU data, e.g. PlanD is a data provider of Building CSU who offers their existing podiums to form the first batch of podium data in the CSU. There are situations that the data provider and Data Owner of common data attributes will be the same PD). Data providers would be responsible to make reasonable effort to ensure the quality, completeness and currency of the provided data and convert them to the requirement conforming to the agreed CSU specification, to produce the initial CSU datasets. PDs accepted to compromise their need for quality in terms of data accuracy and completeness (to a reasonable extent) given the limited timeframe and resources, as some data are not readily available in the required formats, such as conversion from hardcopy, and podium polygons. Manual conversions would be minimized in order to allow the one-off conversion be automated as far as possible. In the situation when the data provider is a PD different from the respective Data Owner, it might not be to the data provider's PD business agenda to complete this one off conversion to a high data quality within the committed time schedule. PDs accepted to compromise their need with the timely availability of the data. Details for Building CSU, Lot CSU, Road Centreline CSU, Slope CSU and TPU / SB CSU are discussed in the respective Appendices E to I. The appendices focus on the one-off data conversion exercise and arrangements to be conducted by PDs for the 5 CSUs.

(b) Data User(s) of a particular CSU is recommended to establish and maintain a mapping between the departmental ID of their core system(s) with the CSU ID of the initial CSU dataset produced.

5.1.2 The respective data providers / Data Owners and Data Users have prepared their own estimates (please refer to section 11.3) for the resources required to complete this one-off data conversion exercise. They have agreed on the following rules / arrangement prior to preparing the estimate:

(a) General principles and assumptions of the one-off data conversion exercise:

(i) Despite the fact that not every received data is available in electronic format, each PD has managed to find their own means to maintain their own set of data for the existing slopes, buildings, lots, road centrelines, and TPU / SB good for their business use. For example, on receipt of paper records, some PDs might have already manually keyed in the data required into their own systems. Though it would be desirable to have a full set of converted CSU data on implementation of DAM, there is no imminent need to convert all existing paper record that contain the relevant CSU textual attributes and complete the conversion by a pre-determined date. However, at time when the paper record is converted into digital format for some other reasons, data providers / Data Owners should contribute the converted data to the CSU and make such data available to other PDs to improve efficiency and minimize duplication of effort within the government.

(ii) It is acceptable to Data Users if the data providers / Data Owners choose not to convert existing paper records relevant to the CSU in the initial CSU dataset. For example, for existing buildings, data attributes of Building CSU not recorded in digital format would not be converted by data providers / Data Owners and data attributes of the these records would be left blank in the initial CSU dataset. Since conversions from paper records are very costly and Data Users have "turn around solutions", it may not be crucial to have such data available in the initial dataset.

(iii) As a general principle, this one-off data conversion exercise should be an automated process. Customised computer programs should be used as far as possible and manual conversion effort should be minimized.

(b) Scope of data conversion – This describes what existing data need to be included in the one off conversion. Also it includes:

(i) CSU Attributes and their priority for conversion in terms of Critical (C), High (H), Medium (M) and Low (L)

(ii) Data provider(s) for the respective data attributes

(c) Conversion arrangement - This outlines the proposed arrangement which each designated PD (who is responsible to convert information of their existing data to conform to the CSU specification) has to follow.

5.1.3 The scope of data conversion and the conversion arrangement for producing the initial sets of each of the five CSUs will be described in the following sections, whereas the schedule of the data conversion together with that of the system revamping works will be covered in Section 6 Programme of Adoption.

Scope of Conversion and conversion arrangement for Slope CSU

5.1.4 The data conversion exercise would cover the conversion of all existing slope features and Maintenance Responsibility (MR) data currently maintained by CED's Slope Information System (SIS) and LandsD's Slope Maintenance Responsibility Information System (SMRIS) respectively.

5.1.5 In addition to that, CED is required to update the attributes that give the CSU status and timestamp of the existing slope features.

5.1.6 The existing SIS does not have information about the features of Defense Measure and Stability Measure, which are newly stipulated in the latest version of the GeoGuide 5. In the context of slope registration, CED has agreed with other departments that one-off data conversion of these existing features would not be required since this information is currently not recorded in the departments' inventories. A similar rule applies to Slope CSU since this information is currently not recorded in Data Owners' inventories and it would be quite a costly exercise to collect this information. Nevertheless, information of new features of these kinds should be recorded in the Slope CSU.

5.1.7 As CED has maintained a repository which keeps a copy of the record of all existing slope features now being maintained by various Data Owners, except for LandsD, these Data Owners are not required to carry out data conversion programme of their own.

5.1.8 To speed up the data conversion process, it is recommended to automate the data conversion as far as possible.

5.1.9 The prioritization of related data attributes in the conversion exercise and the conversion approach are documented in Appendix H, with the data conversion tasks and activities to be carried out by CED and LandsD.

5.1.10 There is no one-off data conversion required for other Data Owners. In general, each Data Owner would need to maintain the mapping between their departmental identifier of the slope dataset with the Slope CSU identifier. Since all of the Data Owners have already stored the CSU ID (which is identical to the Feature Number currently used by the CED's SIS) in their inventory systems, there is no additional effort required for its mapping.

5.1.11 A schedule for the data conversion exercise, assuming that resource will be made available by April 2004, is summarized in Section 6.2.8.

Scope of Conversion and conversion arrangement for Building CSU

5.1.12 All categories of existing buildings under the scope of the Building CSU will be included in the conversion exercise:

(a) Category 1: Both towers and podiums of Legal Private Buildings, and Housing Authority (HA) / Housing Society (HS) buildings under jurisdiction of the Buildings Ordinance (this includes HA's Home Ownership Scheme (HOS) buildings developed under the Private Sector

Participation Scheme (PSPS) and HS's buildings that require an occupation permit and are under enforcement of the Buildings Ordinance);

(b) Category 2: New Territories Small Houses (a type of New Territories Exempted House (NTEH));

(c) Category 3: HA Buildings (including towers and podiums) - public housing and HOS estates (but except those under PSPS);

(d) Category 4: Other Government Buildings - including towers and podiums of government owned properties such as government offices, public schools, hospitals, etc.;

(e) Category 5: Miscellaneous Structures including temporary and open structures.

5.1.13 For each of the above building categories, the scope covers active buildings[4] only. As of September 2003, the records of active buildings (non-podiums) maintained in LandsD amounted to 190k records.

5.1.14 To speed up the data conversion process, it is recommended to automate the data conversion as far as possible. The overall recommended schedule and programme for the conversion exercise is provided in Section 6.3.5, and the detailed data conversion arrangement for the Building CSU is described in Appendix E, Data Conversion Exercise – Building.

5.1.15 The scope of data conversion for the existing buildings is summarized below:

(a) Inclusion of spatial data of all active buildings maintained by LandsD and PlanD (for podiums) as of the conversion cut-off date;

(b) There are PDs (other than Data Owners) who are maintaining data attribute of existing buildings good for CSU application. To relieve the workload of the respective Data Owners in this data conversion exercise for existing buildings, respective PDs agreed to take up the data providers' role and to contribute their data (in the context CSU attributes) as the first available batch data to the Data Agent. This first batch of data to be sent from these designated PDs shall conform to the CSU definition;

(c) Conversion of textual attributes prioritized in terms of High, Medium and Low as described in section 3.2.6 of Appendix E;

(d) Data Agent and data providers (also include all Data Users) would conduct a conversion trial (it is likely that an area in Shatin will be selected for this trial conversion) to assess the technical and resources implications

[4] The active buildings are those marked active as in data provider's system, and the number of records in their system is outlined in Section 3 of Appendix E.

for data conversion and mapping of CSU ID and departmental records of existing buildings.

5.1.16 The conversion approach, with details of the data conversion tasks and activities to be carried out by BD, C&SD, LandsD, PlanD and RVD respectively, are documented in Appendix E. A key step of the data conversion exercise is for these data provider PDs to build up a mapping between the Building CSU identifier with the departmental identifier of existing buildings in their core system(s).

5.1.17 A working team, represented by members from the Data Agent, Data Owners and Data Users shall be formed at Stage 0 of the data conversion exercise (please see section 6.3.5(a)). If schedule permits, the DDS implementation team will not join until Stage 1 when the trial run begins, and they will play a coordinating role in the exercise.

5.1.18 A schedule for the data conversion exercise, assuming that resource will be made available by April 2004, is summarized in Section 6.3.

Scope of Conversion and conversion arrangement for Lot CSU

5.1.19 Existing lots shall include the lots already recorded by LandsD in the spatial record of the latest version of C1000 as of the data conversion cutoff date.

5.1.20 For the existing lots, data attributes of Lot CSU not recorded in digital format will not be converted and these data attributes of the concerned records will be left blank in the initial CSU dataset. This is because conversion from paper records would be costly while it may not be critical to have the data available in CSU dataset.

5.1.21 Only the active lot records are included in the scope of conversion. Inactive records are excluded. Inactive lot includes surrendered / resumed / subdivided lot.

5.1.22 As of July 2003, there are 365K lot boundaries records in LOT and OVERLAP LOT layers maintained in LandsD's C1000 library.

5.1.23 It is noted the peculiar lots (around 2,650 out of total of 531K records in LR's LRS as in early 2003, which include both active and inactive lots) cannot be matched with the Lot CSU ID automatically.

5.1.24 The initial set of Lot CSUs will be created from the LOT and OVERLAPLOT layers in LandsD's C1000 library. The Lot ID in C1000-format will be used to uniquely identify the CSUs.

5.1.25 The following representations of Lot IDs will be converted from the active Lot Registers from LR's IRIS.

(a) LR's structural format (including eleven components, namely Lot Type, Lot Number, Section 1, Subsection 1, Section 2, Subsection 2, Section 3, Subsection 3, Section 4, Extension and Miscellaneous Item) in the Land Registration System (LRS) to be used as part of address identifier in the

Integrated Registration Information System (IRIS) - Lot type, lot number, not more than 4 sections plus 3 subsections, extensions and an indicator of peculiar lots are stored in predefined fields.

(b) LR's Property Reference Number (PRN) to be adopted in IRIS - an 8-character unique identifier of lot registers.

(c) The full English lot description.

5.1.26 The prioritization of related data attributes in the conversion exercise and the conversion approach are documented in Appendix F, with the data conversion tasks and activities to be carried out by LandsD and LR.

5.1.27 The Data Dissemination System (DDS) implementation team should develop a matching program to build up the data linkage automatically for the extracted data from LandsD and LR to formulate a complete Lot CSU data. For data that cannot be matched automatically by the conversion program, they will be left as broken link data after imported into the lot CSU centralized database. An on-going manual matching process is recommended to be taken up by the Data Owners, LandsD and LR, for those data failed to be matched automatically. The manual process will be performed on a need basis during the maintenance of the Lot data provided that resources permit.

5.1.28 Other than LandsD and LR, there is no one-off data conversion required from other Data Owners. In general, each Data User would need to maintain the mapping between their departmental identifier of the dataset with the Lot CSU identifier. Since most Data Users have already adopted the CSU ID (which is identical to the Lot ID currently in LandsD's C1000 library) in their inventory systems, there is no additional effort required for its mapping. It is optional whether PDs really need to maintain a mapping table between the departmental ID and the Lot CSU ID for the initial set of lot data.

5.1.29 A preliminary schedule for the data conversion exercise is summarized in Section 6.4.

Scope of Conversion and conversion arrangement for Road Centreline CSU

5.1.30 The data conversion exercise would cover the conversion of all existing road centrelines maintained in the Street layer of LandsD's Basic Mapping System (BMS) into the logical structure conforming to the Road Centreline CSU Specification. Existing road centrelines shall include those already recorded by LandsD as of the data conversion cut-off date.

5.1.31 All categories of existing road centrelines under the scope of the Road Centreline CSU will be included in the conversion exercise. The types include:-

(a) Expressway;

(b) Main Road;

(c) Secondary Road;

(d) Elevated Road, Flyover, Road Bridge;

(e) Tunnel;

(f) Non-motorable Track;

(g) Closed Road; and

(h) Restricted Access.

5.1.32 Each road segment will be converted into a Road Centreline CSU and assigned with a unique CSU ID by the Data Agent i.e. LandsD, who is also the only data provider of road centreline data.

5.1.33 It is proposed that LandsD, as the data provider, would convert existing data into the CSU structure and ensuring the correctness of the converted data. A priority of conversion and related entity for each attribute are summarized in Table 7 of Appendix G.

5.1.34 The prioritization of related data attributes in the conversion exercise and the conversion approach are documented in Appendix G, with the data conversion tasks and activities to be carried out by LandsD only.

5.1.35 There is no one-off data conversion required for other Data Users. In general, each Data User would need to maintain the mapping between their departmental identifier of the Road Centreline dataset with the Road Centreline CSU identifier. Since all of the Data Users have already stored the CSU ID (which is derived from the Street Code in LandsD) in their inventory systems, there would be very little additional effort required for its mapping, and it would be optional for the Data Users.

5.1.36 A schedule for the data conversion exercise is summarized in Section 6.5.

Scope of Conversion and conversion arrangement for TPU/SB CSU

5.1.37 Existing TPU / SB shall include the boundaries of TPU / SB of 2001, and first 7 years of population projections data, including base year 2003.

5.1.38 The prioritization of related data attributes in the conversion exercise and the conversion approach are documented in Appendix I, with the data conversion tasks and activities to be carried out by PlanD only.

5.1.39 The common attributes included in the TPU / SB CSU Logical Data Model are in alignment with the existing data structure of TPU / SB. It is envisaged that with the existing conversion tool, PlanD could carry out the data conversion of TPU / SB data with minimal effort.

5.1.40 There is no one-off data conversion required from other Data Users. In general, each Data User would need to maintain the mapping between their departmental identifier of the dataset with the TPU / SB CSU identifier. Since all Data Users have already stored the CSU ID (which is identical to the TPU number currently in PlanD's Town Planning Information System, TPIS) in their inventory systems, there is no additional effort required for its mapping.

5.1.41 A schedule for the data conversion exercise, assuming that resource will be made available in early 2004, is summarized in Section 6.6.

5.2 Data Dissemination Requirement

5.2.1 Suitable data dissemination facility hosted by the Data Agent is required to serve two purposes:

(a) Data provisions from Data Owners to Data Agent

(b) Data dissemination by Data Agent to Data Users

5.2.2 Upon the implementation of CSU, the Data Users have to acquire the data from the Data Agent, rather than obtaining data from each respective Data Owners.

5.2.3 To minimize duplicated effort of data dissemination, CSU data should be disseminated from a single source, i.e. Data Agent. Among the 13 PDs, the current mode of dissemination of the PLW data, when CSU related, will cease and replaced by the Data Agent's data dissemination system. On the other hand, for those PLW data which is yet to be included in the CSU dataset, the current mode of data exchange still applies.

5.2.4 In view of the interim measures in the context of DAM, Data Agents would have to make use of the existing IT infrastructure, when applicable, for this purpose. As the DAMs are formulated to provide a quick relief to resolve pressing issues amongst PDs in the near term. The requirements, facilities and infrastructure for data sharing and dissemination in the long-term are subject to further review and improvement in the DAF. Data dissemination of the five CSUs are as follows:

(a) CED's existing Intranet web site is recommended and will be enhanced for Slope CSU dissemination.

(b) PlanD will disseminate the TPU/SB CSU via the department portal programme (DPP).

(c) LandsD, being the Data Agent of the three CSUs (Building, Lot and Road Centreline), will host the data dissemination system and be responsible for disseminating these three CSU datasets. A feasibility study supplementary to the Feasibility Study of LandsD Data Dissemination System (DDS) is currently in progress to review if the infrastructure to be provided for data dissemination of Building CSU, Lot CSU and Road Centerline CSU by the Data Agent (i.e. LandsD) could share with the infrastructure to be provided in LandsD DDS. It is scheduled that the supplementary study would be completed by June 2004.

5.2.5 The methods of disseminating the CSU datasets and the schedule of completing the dissemination facilities for each CSUs will be discussed in section 5.2.6 to 5.2.12.

Data Dissemination of Slope CSU

5.2.6 On implementation of Slope CSU, CED will provide a one-stop service to disseminate both the slope feature and Maintenance Responsibility (MR) data which are included in the Slope CSU dataset. To minimize duplicated effort, LandsD could advise PDs to obtain MR information from CED, nevertheless, they will still provide bi-monthly notification to each respective PDs regarding the change of MR.

5.2.7 The slope feature data is currently disseminated via CED 's Hong Kong Slope Safety website (Intranet version). To meet the resources and time requirement for DAM purpose, it is considered that it would be an affordable solution to enhance the existing web site to support the Slope CSU dissemination.

5.2.8 The Slope Safety website is currently being hosted on the Central Cyber Government Office (CCGO), the latter of which is a one-stop intranet hub providing information and electronic services needed by government users to support their daily work. CCGO targeted to be an intra-governmental information sharing centre, a webcasting station and an intra-governmental business centre. Its URL address will be:
http://geosis.ccgo.hksarg/hkss/eng/whatsnew/updated_SIS/index.htm.

Data Dissemination of TPU/SB CSU

5.2.9 PlanD will be the Data Agent for TPU/SB CSU. They are required to prepare the data conforming to the CSU logical data model, and then convert them into the standard file formats prior to data dissemination.

5.2.10 The solution for disseminating the TPU/SB CSU is via the department portal programme (DPP) of PlanD, which will be implemented by mid 2004. This portal will be launched as an Intranet portal with authentication and other advanced features such as download by criteria. Instead of collecting the data by CD-ROM (current practice), Data Users can access the Intranet and download the CSU data from this single source. Only the authorized government officers can browse, search or download TPU/SB CSU information from the website.

5.2.11 To streamline future data exchange process, PDs are encouraged to use the new dissemination facility, thus the existing channel(s) through written requests will no longer be supported. However, should PDs require population data (7+ years), which is classified as sensitive data, and not incorporated in the scope of the TPU/SB CSU, such requests, are still supported by PlanD under individual request.

Data Dissemination of Building CSU, Lot CSU, and Road Centreline CSU

5.2.12 LandsD has recently completed a Feasibility Study (FS) on a Data Dissemination System (CLIS DDS). The objectives of the proposed system are described as follows:

(a) To set up a multi-format digital map and land record database and a data communication infrastructure such as Wide Area Network (WAN) for the dissemination of the required digital map and land record data in the appropriate data format to the computer system of the client departments, the private sector and the general public;

(b) To shorten the queuing and processing time for the data conversion and delivery of digital map and land record data in the user required data format;

(c) To optimize the staff resources required to carry out the data format conversion; and

(d) To reduce the operation and administration cost of disseminating digital map and land record data.

5.2.13 Among the different business options considered in the FS, it was recommended in the FS Report that CLIS DDS should be implemented with data conversion and dissemination. . A feasibility study supplementary to the Feasibility Study of LandsD Data Dissemination System (DDS) is currently in progress to review if the infrastructure to be provided for data dissemination of Building CSU, Lot CSU and Road Centerline CSU by the Data Agent (i.e. LandsD) could share with the infrastructure to be provided in LandsD CLIS DDS.

5.2.14 Detailed discussion on the implementation options for the data dissemination system for Building CSU, Lot CSU and Road Centreline CSU is available in Appendix J.

6 Programme of Adoption

6.1 Overview

6.1.1 A programme for adoption of each CSU is prepared given the requirements from system enhancements and the one-off data conversion that will take place in PDs.

6.1.2 To conform to the interfacing requirements, enhancements of PDs' existing systems are required prior to implementation of CSU. These enhancements include both technical measures and administrative controls:

(a) Technical measures - such as system revamping, enhancements and / or implementations to facilitate:-

(i) Regular submission of data updates from Data Owners to respective Data Agents in accordance to the CSU specifications;

(ii) Data exchange using file formats standard;

(iii) Preparation of CSU data, including the integration, manipulation and conversion of received data by Data Agents, including the assignment and maintenance of the unique CSU ID;

(iv) Regular dissemination of CSU by Data Agents for retrieval by Data Users;

(v) Mapping of CSU ID and Departmental IDs by Data Owners and Data Users.

(b) Administrative controls – such as changes in work procedures to facilitate:-

(i) Adoption of softcopies in maintenance and exchange of CSU data; for example, changes in Geoguide5 in submission of slope data to CED

(ii) Adoption of new survey guidelines and delineation rules;

(iii) Adoption of new data definitions as defined in the CSU specifications;

(iv) Adoption of new workflows as applicable for the CSUs.

6.1.3 In addition to the above-mentioned enhancements, an one-off data conversion exercise per CSU is required:

(a) To produce the initial CSU datasets produced from PDs' existing data;

(b) To create a mapping of CSU ID and Departmental ID for the initial CSU dataset with corresponding data records in PDs' existing core systems.

6.1.4 A resource estimation exercise was performed to estimate the resources required in terms of cost, timeframe and the earliest timeframe available for system enhancement and modification for the CSUs, based on the System Interfacing specifications and data conversion programme recommended for the 5 CSUs.

Details are presented in the following sections. Section 6.2 to 6.6 illustrates the program of adoption for each of the CSUs.

6.2 Slope CSU

System Enhancements

6.2.1 System enhancement is required to facilitate the data exchange between Data Agent and Data Owners, and between Data Agent and Data Owners. The requirements are summarized below:

(a) Data Agent - CED is required to perform revamping in their Slope Information System (SIS) and Computerized Slope Registration and Location Plan System (CSRLP). CED can start their revamping development as early as Jan 2004 and target to complete the enhancement within 14 months. For better coordination with the revamping schedule of other PDs, it is recommended that CED should start its conversion on Apr 2004.

(b) Data Owners

(i) ArchSD is unable to provide the earliest date for starting the system revamping exercise pending the decision to be made by their senior management. They estimate that the exercise will be completed within the timeframe of one year.

(ii) CED is a Data Owner for the slope data originating from non-government agencies (when the responsible agents for slope works are private developers). CED is delegated with the authority to receive and register slope data from the data source agent, and prepare data according to the CSU specification. CED would revise the existing Slope Input Program for data submission to conform to the Slope CSU specification and DAM 3 requirement. Data Owners who do not have their customized application can also make use of this application.

(iii) DSD estimated that the system revamping in their Automated Mapping System / Slope Inventory Management System would require a timeframe of 6 -12 months to complete;

(iv) HyD is unable to estimate the earliest start date. However, the total system enhancement effort in their Road Data Maintenance System (RDMS) is expected to take only 7 man-days, over a duration of one month;

(v) LandsD is unable to provide the earliest date for starting the exercise pending the decision to be made by their senior management. They estimate that system enhancements will be required in their:-

- Slope Maintenance Registration Information System (SMRIS) - which takes approximately 2.5 months to complete.
- Both Computerized Land Information System (CLIS) and Geospatial Information Hub (GIH) - which will take a total of 2.5 months to complete;

(vi) TDD – as there is no Slope data information system in TDD, the system revamping exercise is not applicable to them.

6.2.2 Figure 20 summarizes the timeframes estimated by PDs to carry out system revamping to meet the system interfacing specification of Slope CSU.

Administrative Controls and Procedures

6.2.3 CED will make corresponding amendments in Geoguide5 with respect to changes in the slope data attributes required in future slope registration.

6.2.4 In line with the e-Government initiative and to help streamline the data exchange processes and workflow, Data Owners are strongly recommended to submit softcopy to CED in future. CED agreed to provide a specification for the softcopy submission of the slope plan that would define the layers used, the coordinate system, and relevant backdrop information. For future submission, Data Owners have to comply with this specification.

6.2.5 PDs have pointed out that there would be additional efforts for their consultants / contractors to provide softcopies for new slope registration, engineering inspections and routine inspections. In view that there is currently no requirement for provision of softcopy slope plans included in Works Departments' existing consultancy agreements, it would not be cost-effective to make a change request for additional services at this stage. Rather, this requirement should be only applicable to future submissions and to be stipulated in the new contracts. It is expected that the provision of softcopies should incur minimal costs, as most of the consultants / contractors are already using CAD tools to prepare the drawings.

6.2.6 According to HyD, the existing contract with their consultant would not end until late 2007, so it is foreseen that hardcopy only submissions would still have to be allowed until then.

6.2.7 Depending on the availability of resources, it is recommended that the overall revamping exercise of the Slope CSU should commence no later than April 2004 and complete by March 2005.

One-Off Data Conversion Schedule

6.2.8 It has been agreed by the sub-working group that the data conversion exercise commence in May 2004. The exercise will take approximately 7 months, with full details documented in Appendix H, and summarized as follows:-

Task	Responsible PDs	Start	Duration
a) Define the mapping rules	LandsD, CED	May 2004	1 month
b1) Develop the data conversion tool	CED	Jun 2004	2 months
b2) Develop the data conversion tool	LandsD	Jun 2004	2 months
c) Convert existing Maintenance Responsibility (MR) data	LandsD	Aug 2004	2 months
d) Release MR data to CED with timestamp assigned	LandsD	Oct 2004	NA
e) Convert existing Slope Feature data	CED	Aug 2004	1 month
f) Ensure consistency between MR and Slope Feature Data	CED	Oct 2004	2 months (tentative)
g) Ensure the consistency between graphical and textual data	CED	Dec 2004	1 month
h) Release the data to the Data Users with timestamp assigned	CED	Feb 2005	NA

Table 5 Agreed Data Conversion Schedule for Slope CSU

Programme

6.2.9 The overall programme for Slope CSU takes around 12 14 elapsed months, as illustrated in Figure 20:-

(a) Funding application should be completed by 2004 Q1.

(b) Enhancements in PDs' existing systems will take 14 elapsed months;

(c) One-off data conversion exercise will take around 10 elapsed months.

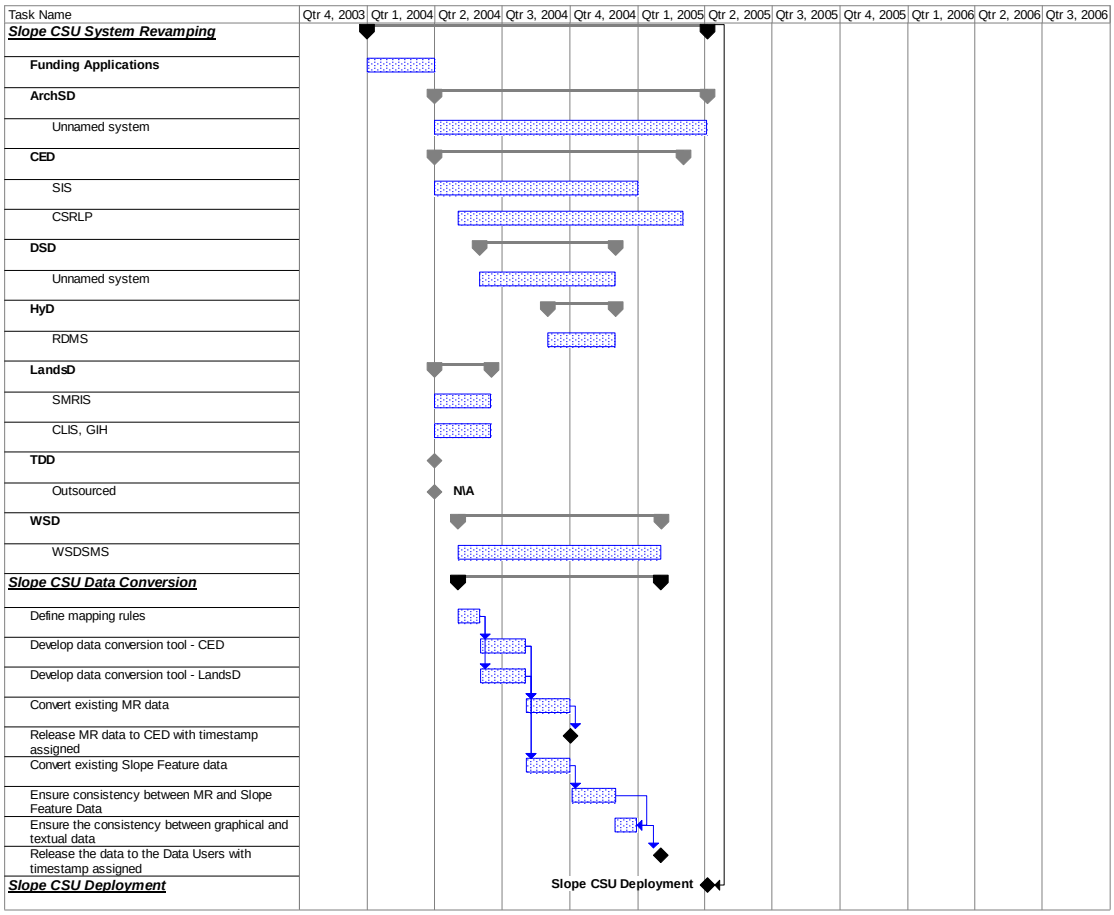


Figure 20 Programme for Adoption of Slope CSU - System Revamping and One-Off Data Conversion

6.3 Building CSU

System Enhancements

6.3.1 The system enhancement requirements are summarized below:

(a) Data Agent – As an advance task, a feasibility study supplementary to the completed Feasibility Study of LandsD's CLIS DDS is in progress to review if the same infrastructure could be deployed for data dissemination of Building CSU, Lot CSU and Road Centreline CSUs. Upon completion of the supplementary FS in June 2004, implementation schedule will be prepared. It is estimated that the implementation will last for one year.

(b) Data Owners

(i) ArchSD is planning a major enhancement in their departmental system (outside the scope of DAM), and has considered implementation of a GIS component. However, it is unlikely that they could spare resources for the GIS implementation in the coming year. As there is also no concrete plan to implement this

component, there would be zero revamping effort estimated for ArchSD to contribute data to the CSU.

(ii) BD is in process of implementing a new BDGIS, design of which is based on the Building CSU Logical Data Model. Phase 2 implementation, which starts in 2004, would support the import / export interface with the Data Agent's central database.

(iii) LandsD is unable to provide the earliest date for starting the exercise pending the decision to be made by their senior management. Due to a large number of internal systems containing building related information, subject to the workload and availability of resources, the revamping activities might not be performed in parallel and will need to be prioritized and performed in sequence accordingly. LandsD has to perform:-

(1) System modification in Computerized Land Information System (CLIS) which takes 8 months;

(2) Modifications in Customized Data Conversion Tools which take 2 months;

(3) System modifications in Geographic Information Retrieval System (GIRS) and Geospatial Information Hub (GIH) which take a total of 3 months; and

(4) Implementation of a new system "DAM_IN / DAM_OUT" in the Survey and Mapping Office (SMO) which takes 6 months;

(5) Implementation of LGIS, a new web-based system in Lands Administration Office (LAO), which takes 5 months.

(iv) PlanD - Due to a large number of internal systems containing building related information, PlanD has to perform:-

(1) System enhancement in GIS portal which takes 1 month;

(2) System Modifications in Building Dilapidation and Rehabilitation Information System (BDRIS) which take 5 months;

(3) System modifications in Redpot system which take 1 month; and

(4) Modifications in Customized programs which take 1 month.

(v) RVD – The estimated effort is for development of a program and file transfer mechanism for providing and receiving data between the Data Agent and RVD. The matching of CSU spatial data and RVD's spatial data will be absorbed as RVD routine maintenance job.

(c) Data Users

(i) C&SD estimated that system modification in their Digital Mapping System (DMS) would require around 4 months to complete.

6.3.2 Figure 21 summarizes the time estimated by PDs who need to carry out system revamping in their systems to meet the system interfacing specification of Building CSU.

Administrative Controls and Procedures

6.3.3 LandsD will make corresponding amendments in the B1000 specification to include:

(a) the ground survey of podiums and to close the podium lines to form polygons for new podiums (i.e. podium buildings constructed upon implementation of Building CSU).

(b) the ground survey of a certain structures < $10m^2$ which will be determined by LandsD.

6.3.4 Depending on the availability of resources, and to be in line with the implementation of LandsD's DDS, it is recommended that the overall revamping exercise of the Building CSU commences in Oct 2004 and completes in Jun 2005. The overall revamping exercise is expected to last for 8 months.

One-Off Data Conversion Schedule

6.3.5 Due to the availability of resources, it is recommended the data conversion exercise should commence no later than April 2004. The exercise comprises three stages over a period of 15 months and summarized as follows:-

(a) Stage 0 – Preparation (4 months)

(i) Project Initiation – to establish a working team, represented by members from the Data Agent, Data Owners and Data Users, and to agree on a detail plan;

(ii) Team Forming – to arrange procurements and to appoint consultant for the work in case of outsourcing the conversion task;

(b) Stage 1 – Trial Run (5.5 months)

(i) The DDS implementation team will join the scene at this stage and participate as a coordinator role in the working team. The DDS implementation team shall review the conversion schedule with data providers, the working team members, and coordinate activities amongst the different parties, ensuring that activities are held according to plan. During Stage 1 and 2, the implementation team will play an active role in coordinating and leading the different activities, with close liaisons with all concerned parties;

(ii) Development of conversion program – each PD to build corresponding programs and map their departmental records with the base CSUs supplied by LandsD;

(iii) Execution – conversion trial is held, and each PD to report progress and results to the working team.

(c) Stage 2 – Actual Run (5 months)

(i) Preparation - The DDS implementation team will have produced the physical data structure of the Building CSU at this stage. At the same time, PDs should refine their programs, and resolve the problems that occur in the trial run. PDs would agree on a cut-off date for the data to be converted.

(ii) Execution (Phase 0, 1, 2) - Data providers will continue to build up a mapping between the base CSUs and their departmental records, and then extract their responsible data attributes to produce the raw data files. The DDS Implementation project team will collect raw data files from all data providers and merge them into the initial CSU dataset.

Programme

6.3.6 The overall programme for Building CSU takes around 15 elapsed months, as illustrated in Figure 21:-

(a) Funding application should be completed by 2004 Q1.

(b) Enhancements in PDs' existing system will take around 8 months;

(c) The one-off data conversion will take around 15 elapsed months.

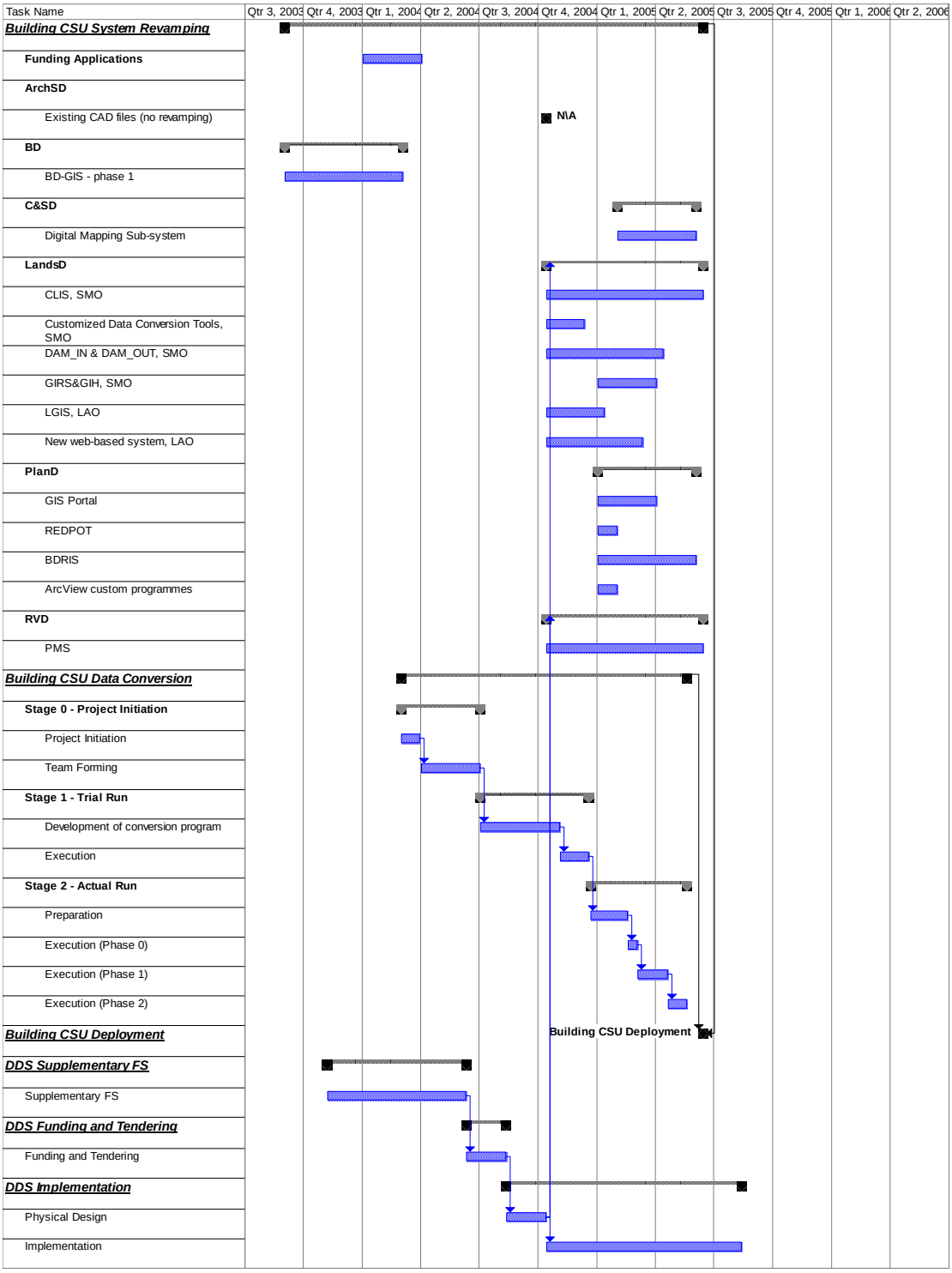


Figure 21 Programme for Adoption of Building CSU - System Revamping and One-Off Data Conversion

6.4 Lot CSU

System Enhancements

6.4.1 The system enhancement requirements are summarised below:

(a) Data Agent – As an advance task, a feasibility study supplementary to the completed Feasibility Study of LandsD's DDS is in progress to review if

the same infrastructure could be deployed for data dissemination of Building, Lot and Road Centreline CSUs. Upon completion of the supplementary FS in Jun 2004, implementation schedule will be prepared. It is estimated that the implementation will last for one year.

(b) Data Owners

(i) LandsD - is unable to provide the earliest date for starting the exercise pending the decision to be made by their senior management. Due to a large number of internal systems containing lot information, LandsD has to perform:-

(1) System modification in Cadastral Information System (CIS) which takes 8 months;

(2) Modifications in Conversion programs for Map Sales which take 3 months;

(3) System modifications in Geospatial Information Hub (GIH), LPBRD and SMRIS – each requiring 1 month;

(4) Implementation of a new system "DAM_CIS" in SMO that takes 3 months;

(5) System modifications in QMS which require 2 months.

(ii) LR agreed that the requested enhancements in IRIS would be duly considered on commencement of the nursing period of IRIS (in Q2 of 2004). The items included -

(1) Lot ID in C1000 Format to be captured in IRIS;

(2) An IRIS External Interface for the CSU;

(3) Memo to contain PRN;

(4) Relation between Parent Lot and Sub-divided Lot registers in Carving Out to be Captured in IRIS;

(5) Lot Resumption Information.

(c) Data Users

(i) BD and RVD – the system modifications required in BDGIS and PMS for the Lot CSU are already accounted for in the system revamping exercise for the Building CSU;

(ii) CED is planning to implement a GIS system which makes use of the Lot CSU, system modification is not applicable to them;

(iii) DSD – there is no system modification required;

(iv) PlanD – there is no system modification required.

6.4.2 Figure 22 summarizes the time estimated by PDs who need to carry out system revamping in their systems to meet the system interfacing specification of Lot CSU.

Administrative Controls and Procedures

6.4.3 LR would need to revise their procedure to send LandsD two copies of the memo (one each for LAO and SMO) notifying LandsD on subdivision lot information.

6.4.4 LR would need to print the PRN on the standard memo for LandsD.

One-Off Data Conversion Schedule

6.4.5 Due to the availability of resources, it is recommended the data conversion exercise should commence in Q1 of 2005, when the conversion exercise for the Building CSU has commenced for over half a year and is running in the Execution stage. The exercise comprises three stages over a period of 14 months and summarizes as follows:-

(a) Stage 0 – Preparation (4 months)

(i) Project Initiation – to establish a working team, represented by members from the Data Agent, Data Owners and Data Users, and to agree on a detailed plan;

(ii) Team Forming – to arrange procurements and to appoint consultant for the work in case of outsourcing the conversion task;

(b) Stage 1 – Actual Run (8 months)

(i) The DDS implementation team will join the scene at this stage and participate as a coordinator role in the working team;

(ii) Preparation - The DDS implementation team will have produced the physical data structure of the Lot CSU at this stage. PDs would develop their conversion programs, and at the same time, the DDS implementation team should start development of a matching programs;

(iii) Data Extraction - Both LandsD and LR should extract the corresponding textual attribute data and convert into Lot CSU data structure in an agreed transient file format;

(iv) Data Matching Between LandsD and LR - The DDS Implementation project team will use the matching program to build up linkage automatically for the extracted data from LandsD and LR to formulate a complete Lot CSU dataset. For data that cannot be matched automatically by the conversion program, they will be left as broken link data after importing into the lot CSU centralized database.

(c) Stage 2 – Data Users' Conversion (Optional - 2 months)

(i) This is an optional stage for those PDs who really need to maintain a mapping between the departmental ID and the Lot CSU ID for the initial Lot CSU dataset.

Programme

6.4.6 The overall programme for Lot CSU takes around 14 elapsed months, as illustrated in Figure 22:-

(a) Funding application should be completed by 2004 Q1.

(b) Enhancements in PDs' existing system will take around 8 months;

(c) The one-off data conversion will take around 14 elapsed months.

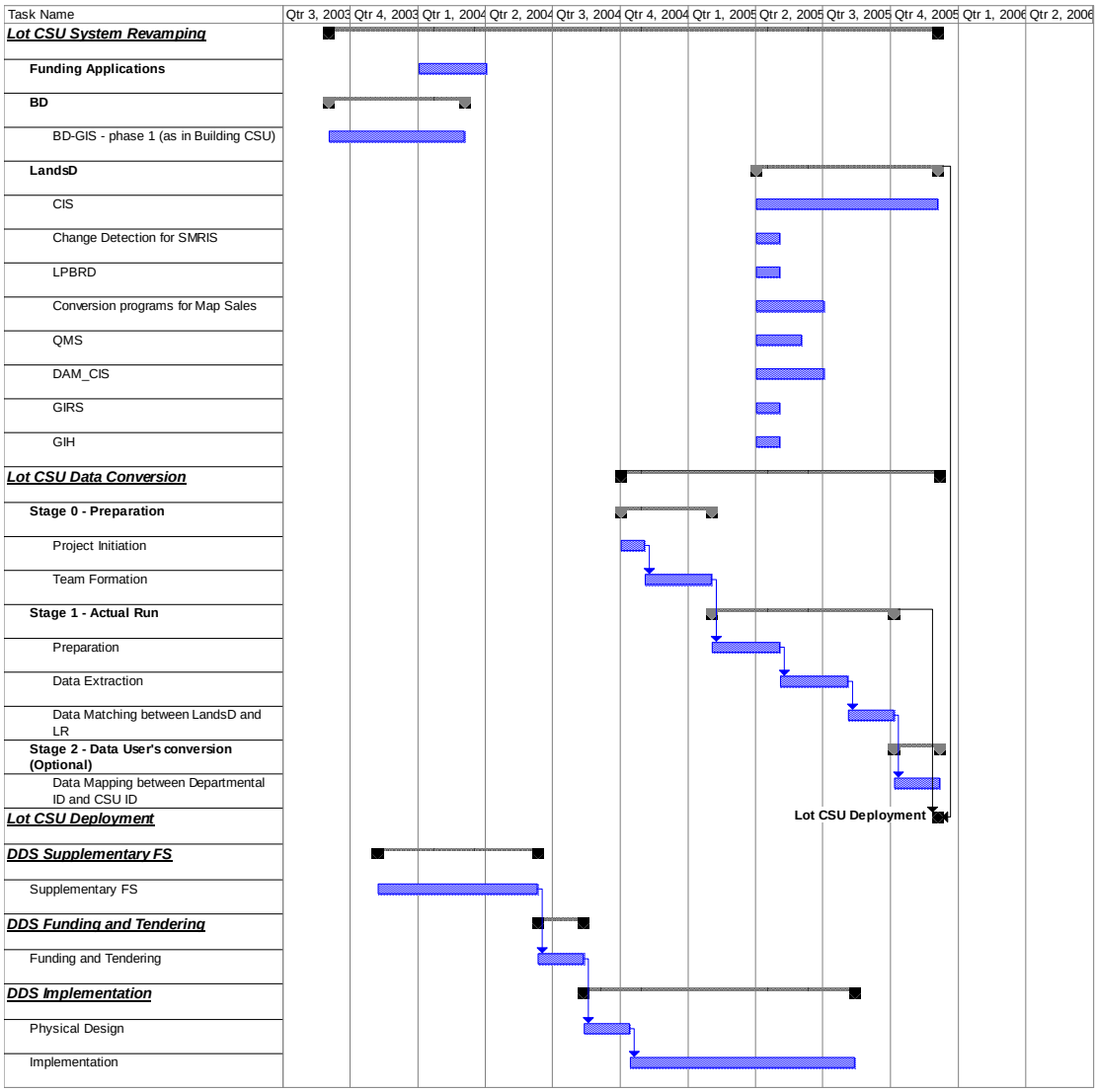


Figure 22 Programme for Adoption of Lot CSU - System Revamping and One-Off Data Conversion

6.5 Road Centreline CSU

System Enhancements

6.5.1 The system enhancement requirements are summarised below.

(a) Data Agent – As an advance task, a feasibility study supplementary to the completed Feasibility Study of LandsD's DDS is in progress to review if the same infrastructure could be deployed for data dissemination of

Building, Lot and Road Centreline CSUs. Upon completion of the supplementary FS in Jun 2004, implementation schedule will be prepared. It is estimated that the implementation will last for 1 year.

(b) Data Owner

(i) LandsD - is unable to provide the earliest date for starting the exercise pending the decision to be made by their senior management. Due to a large number of internal systems containing lot information, LandsD has to perform:-

- System modification in Geographic Information Retrieval System (GIRS) which takes 3 months;
- Modifications in Conversion programs for Map Sales which take 2 months;
- System modification in System (QMS) which takes 3 months;
- Implementation of a new system “DAM_RDEXPORT” in SMO which takes 1 month;

(c) Data Users

(i) CED - there is no system modification required;

(ii) HyD estimated that the earliest start date of revamping could be in Sept 2004. The total system enhancement effort in RDMS is expected to take 7 man-days, over a duration of 3 months;

(iii) PlanD - there is no system modification required.

6.5.2 Figure 23 summarizes the time estimated by PDs who need to carry out system revamping in their systems to meet the system interfacing specification of Road Centreline CSU.

Administrative Controls and Procedures

6.5.3 LandsD has prepared a "Street Centreline Placing Guidelines version 1 (Oct 2003)" on the delineation of road centrelines. LandsD will adopt these guidelines to provide consistent rules in delineating the new road centrelines.

One-Off Data Conversion Schedule

6.5.4 Due to the availability of resources, it is recommended the data conversion exercise commences in Q1 of 2005, when the conversion exercise for the Lot CSU has commenced for over half a year and is running in the Actual Run. The exercise comprises three stages over a period of 13 months and is summarized as follows:-

(a) Stage 0 – Preparation (4 months)

(i) Project Initiation – to establish a working team, represented by members from the Data Agent, Data Owners and Data Users, and to agree on a detailed plan;

(ii) Team Forming – to arrange procurements and to appoint consultant for the work in case of outsourcing the conversion task;

(b) Stage 1 – Implementation (7 months)

(i) Preparation - LandsD would define the mapping rules and algorithm for data conversion;

(ii) Development – a conversion program would be developed to facilitate the automatic assignment of attributes, converting data into the CSU data structure, merging and dissolving the tile-based data into a single seamless layer.

(iii) Execution, quality checking and data rectification - execution will be conducted on the data as of the agreed data conversion cut-off date. Quality checking and data rectification will be performed.

(c) Stage 2 – Data Users' Conversion (Optional - 2 months)

(i) This is an optional stage for those PDs who really need to maintain a mapping between the departmental ID and the Road Centreline CSU ID for the initial Road Centreline CSU dataset.

Programme

6.5.5 The overall programme for Road Centreline CSU takes around 13 elapsed months, as illustrated in Figure 23:-

(a) Funding application should be completed by 2004 Q1.

(b) Enhancements in PDs' existing system will take around 3 months;

(c) The one-off data conversion will take around 13 elapsed months.

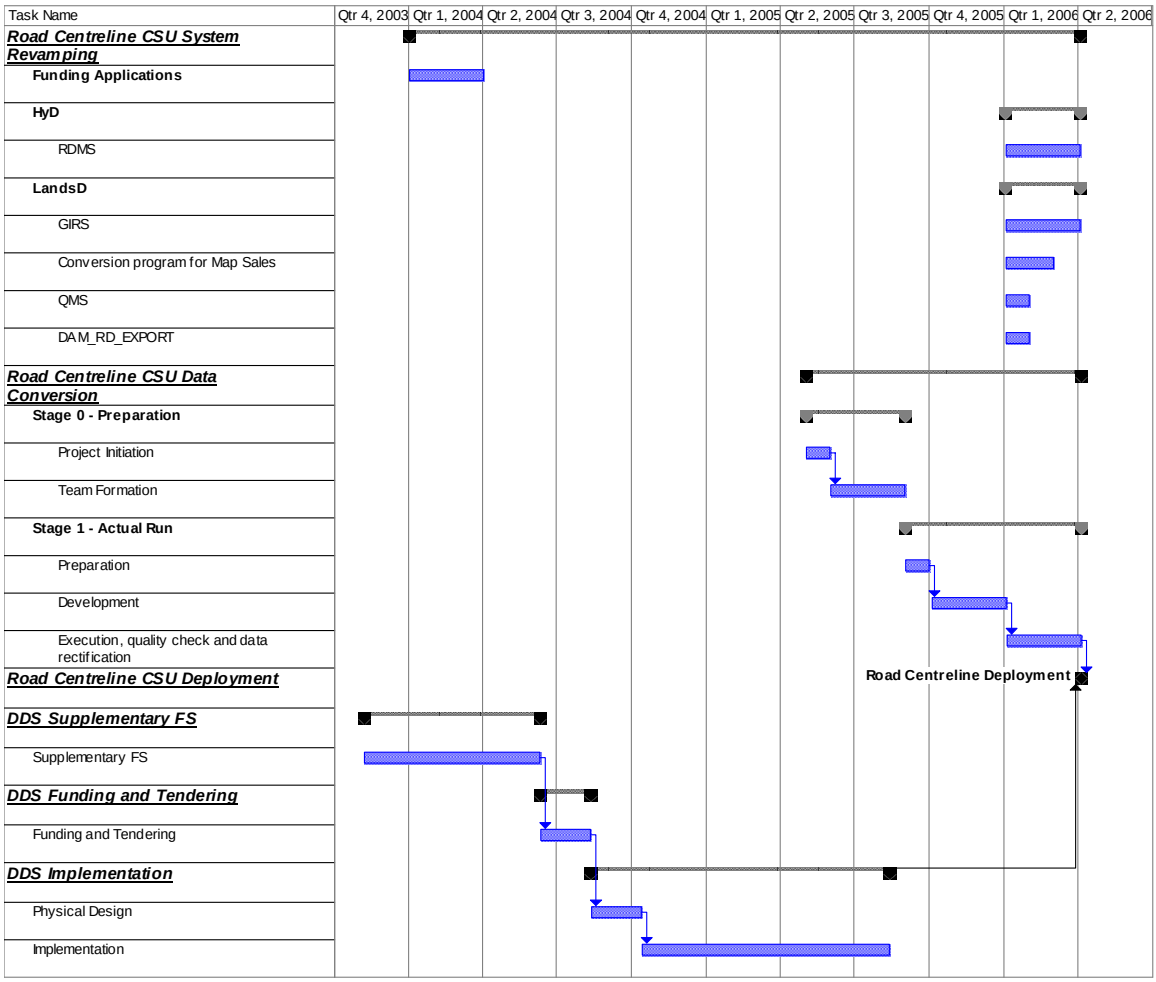


Figure 23 Programme for Adoption of Road Centreline CSU - System Revamping and One-Off Data Conversion

6.6 TPU/SB CSU

System Enhancements

6.6.1 The system enhancement requirements are summarised below:

(a) Data Agent

(i) PlanD will implement a solution for data dissemination of the TPU / SB CSU based on PlanD's GIS portal, which is to be implemented in Q2 2004.

(b) Data Owner

(i) Being the Data Owner of the TPU / SB CSU, PlanD will require 1 man-month of effort to incorporate the associated changes required to accommodate the data structure in the Town Planning Information System (TPIS).

(c) Data Users

(i) LandsD will need 2 months to complete revamping, but they are unable to estimate the earliest month they can start the exercise since there are some dependencies tasks, which are beyond their

estimation. Nevertheless, it is envisaged that effort to be incurred would be relatively small and LandsD could complete this exercise by Q2 of 2004, but is still subject to the resource availability.

(ii) BD, C&SD and TDD remarked that they do not need to perform any system enhancements for future adoption of the TPU / SB CSU.

6.6.2 Figure 24 summarizes the time estimated by PDs who need to carry out system revamping in their systems to meet the system interfacing specification of TPU / SB CSU.

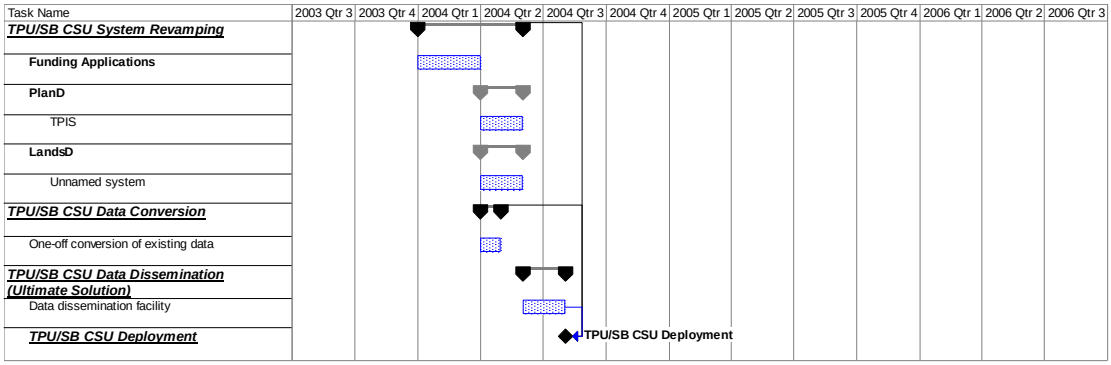


Figure 24 Programme for Adoption of TPU/SB CSU - System Revamping and One-Off Data Conversion

One-Off Data Conversion Schedule

6.6.3 The common attributes included in the TPU / SB CSU Logical Data Model are in alignment with the existing data structure of TPU / SB. It is envisaged that with its existing conversion tool, PlanD could carry out the data conversion of TPU / SB data with minimal effort. Hence, no additional resource is required for its conversion.

6.6.4 Funding application should be completed by 2004 Q1.

6.6.5 It is scheduled that TPU / SB CSU can be commissioned in the earliest within Q2 2004.

7 DAM 2 - Symbology

7.1 Overview

Comparison Between CAD and GIS

7.1.1 CAD and GIS are the two commonly used tools and technologies in the production of drawings and maps respectively. This section discusses how CSWP standard symbols and map symbols would be used by the PDs for these purposes.

7.1.2 Table 6 presents a basic comparison of CAD and GIS.

	CAD	**GIS**
Products	Each organisation might have products from more than one vendor	Each organisation has products from no more than one vendor
Application	Engineering drawings	Maps and spatial analysis
Purpose	For visual review and presentation	For spatial decision support and visualisation
Standards	Each organisation (Works Departments and consultants) has their own CAD standards	Only a few map producing PDs has their own symbology standards
Colour	Relative “static”	Relative dynamic according to map purpose
Characteristics of symbols	Scale “independent”	Scale dependent
Availability of common symbol standards in Hong Kong	CSWP	There are no symbol standards currently maintained in Hong Kong.
Scope of standards	Includes a set of symbols for general use	Each organization still maintains their own standards either on organization basis or on project basis

Table 6 Comparison of CAD and GIS

7.1.3 LandsD BMS (B1000) map is the most popular map used by the PDs. Since the implementation of CSWP, there are cases where overlap symbols (either the meaning of the symbol or the shape itself) exist between symbols maintained in the LandsD BMS (B1000) map and CSWP. These overlapping symbols include:

(a) Building outlines

(b) Noise barriers

(c) Tree landscaping

(d) Pipelines

(e) Spot heights

(f) Fire Hydrants

(g) Slope

7.1.4 There are options to handle these overlapping symbols:

(a) Option 1: Accept the overlapping symbols of CSWP and GIS symbols. Draftsman or cartographer shall have the discretion to replace or retain the symbol depending on the application, theme and background;

(b) Option 2: Adopt the CSWP standard;

(c) Option 3: Adopt the existing symbology standards from the map producing PDs.

7.1.5 CAD-user PDs (e.g. HyD, CED) considered there is no essential need to retain the same base map symbols for drawing purpose. Due to the different scales used in engineering drawing (say, 1:200 and 1:500) compared with a map (1:1,000 and 1:5000), the level of details covered by the base map is quite different and therefore there is no practical need to align the different types of symbols between the two. The draftsmen should have the discretion to decide if they should retain the base map symbol or apply different symbols for that drawing purpose, e.g. if the line of the building polygon would confuse the works details shown on the drawing, he could choose to dim the background or use other symbols, i.e. Option 1 is preferred.

7.1.6 GIS-user PDs opined that CSWP (CAD Standard for Works Projects) does not apply to non Works projects. Since each GIS-user PDs also maintain their own symbology standard for their specific map style purpose, the cartographer should have the discretion to retain the map symbols or apply different symbols for that GIS record purpose, i.e. Option 1 is preferred.

7.1.7 As was explained in previous section, there is no imminent need to remove the overlaps symbols for DAM purpose since the extent of overlap is very limited and the business of the PDs is not affected.

Re-symbolisation

7.1.8 PDs shall have the autonomy to choose their own symbols for their specific presentation purpose. Re-symbolisation is not considered as part of a conversion process, but rather, re-symbolisation is part of the design, development, and production processes for maps and drawings. It is not mandatory for PDs to adopt the symbology standards defined by source agent (e.g. Data Owners for Common Spatial Unit, CSU.

7.1.9 For the benefit of the Data Users who might want to reproduce the symbols from the data source agencies, information about the symbol specification from the data source agencies (e.g. Data Owners for CSU) to depict the exchanged datasets should be made available when requested by the Data Users. Map-producing PDs should produce their own departmental symbol specification and make it available for other PDs' reference.

7.1.10 Volume 2F will give an inventory of GIS maps produced by various map producing PDs and the associated GIS platforms (including the software and version) on which the various symbols are currently supported. These maps include the maps of which the dataset was included in the exchange process among the 13 PDs and these processes were documented in the current environment.

7.2 Inventory of Maps

Use of Symbols in PD's Business Processes

7.2.1 This section examines the business of PDs and reviews how they are involved in the production and usage of maps amongst PDs. This section also documents the inventory of maps produced by the map producing PDs.

7.2.2 PDs are grouped into four categories based on the kind of cartographic symbologies used in their business processes (please refer to Table 7). The four categories include the following:

(a) Category I - Non-Map or Drawing Producer : LR does not process CAD or GIS data. BD and RVD will soon launch their GIS, but they will not be map producing PDs. None of these PDs would have symbols to include in a GIS-based cartographic symbol inventory.

(b) Category II - CAD Drawings Producer: The Works Departments have adopted the CSWP standard to produce drawings in Works projects delivery. The CSWP also applies to all ETWB projects undertaken by their consultants. Some Works Departments also have their own GIS systems. These Category II PDs might also be Category III or IV as well.

(c) Category III- GIS Map Producer without Standard Symbols: Some PDs are producing GIS maps to meet their operational needs, but have not established standard map products for wider distribution. These

departments tend to produce special purpose, one-time maps solely for internal use. For example, C&SD produces the maps for supporting the fieldwork of population censuses / by-censuses and household surveys. Departments that create unique symbols would be responsible for maintaining any information for their own symbols internally. Since no other departments use these symbols, symbols that are created strictly for internal map creation to support specific business needs should not be included in the inventory evaluation. It should be noted, however, that many of the PDs that fall into Category III typically adopt the LandsD Base Map 1:1,000 symbology to represent topographic features.

(d) Category IV - GIS Map Producer with Standard Symbols: These PDs use GIS to produce standardized map products based on their own established symbology standards. LandsD and PlanD are departments that use their GIS to produce standardized maps that are that are that are widely accepted and broadly used by other PDs for many years.

7.2.3 There are some departments who fall into more than one category.

(a) PDs who are in both Category II and III are different from Category IV PDs, in that they do not have a well-defined map style and symbology for map production in GIS. However, they have adopted the CSWP to produce CAD drawings. These departments use both standard CAD symbols and non-standard GIS symbols. Since the GIS symbols of these departments are developed for special purpose maps to meet their own specific business needs they are not included in the inventory that follows.

(b) There are PDs who are in both Category II and IV. These are departments have adopted the CSWP for CAD drawings and who also have GIS standards for GIS map production. For example, WSD currently maintains a slope map series (Slope Record Plans 1:1,000) with standard map products to represent the WSD's responsible slope features.

7.2.4 Table 7 categorizes the PDs by their production of CAD Drawings and GIS Maps:

PDs	Category I Non-Map Producer	Category II CAD Drawings Producer	Category III GIS Map Producer without Standard Symbols.	Category IV GIS Map Producer with Standard Symbols
BD	✔ (will soon move to Category III)			
LandsD				✔
LR	✔			
PlanD		✔		✔
C&SD			✔	
RVD	✔ (will soon move to Category III)			

PDs	Category I Non-Map Producer	Category II CAD Drawings Producer	Category III GIS Map Producer without Standard Symbols.	Category IV GIS Map Producer with Standard Symbols
ArchSD		✔		
CED		✔		✔
DSD		✔	✔	
EMSD		✔	✔	
HyD		✔	✔	
TDD		✔		
WSD		✔		✔

Table 7 Categories of PDs in the usage of maps and drawings

Map Inventory

7.2.5 An inventory of standard maps produced by Category IV PDs was prepared in Table 8 . The inventory contains a list of PDs, and their created map styles and map series names. The term 'map style' is used to describe the overall purpose of the map. The term 'map series' refers to particular "map product line" produced by a PD. For the purpose of this inventory, a map series is produced at a specific scale with a specific thematic content.

7.2.6 There are map dataset included in the data exchange process documented in the current environment description. The inventory of maps and the exchanged datasets in the current environment description are presented in Volume 2F Inventory of GIS Maps. There are a total of 9 map styles or 23 map series that were inventoried and listed in Table 8. Each map style is for a specific business purpose of a PD and of each map style, there might have more than one map series which is scale dependent.

7.2.7 Also included in the table is a map series ID. This unique identifier is associated with a particular map series of a map style. The map series ID is made up of the department name and a number. A theme consists of similar geospatial features typically portrayed together with identical or similar cartographic symbols in the maps.

7.2.8 Among the map producing PDs, the Survey and Mapping Office (SMO) of LandsD is responsible for maintaining a set of digital topographical geospatial datasets. These datasets cover the whole territory of Hong Kong. They were basically converted from the original 1:1,000 scale survey sheets, and are continuously up-dated. The corresponding digital map products are being extensively used in PDs (including LandsD) and many other Government departments for various purposes.

7.2.9 The software commonly used by PDs for map production are as follows:

(a) Arc / Info 6.x;

(b) Arc/Info 7.x;

(c) Arc/Info 8.x (i.e. ArcGIS: ArcView 8, ArcEditor 8, and Arc/Info Workstation 8);

(d) ArcView 3.x; and

(e) Microstation J.

7.2.10 The symbols used on the map of a given map series of a map style is software dependent and also version dependent. The inclusion of details of various GIS software products and the version in the map inventory list could add useful information for symbol reproduction purpose.

PDs	Map Series	Map Series ID	Map Style	Scale	GIS Platform
LandsD	Base Map (B1000)	LandsD_M_01	Topographic Map	1:1,000	Arc/Info 7.2.1
LandsD	Base Map (B5000)	LandsD_M_02	Topographic Map	1:5,000	Arc/Info 7.2.1
LandsD	Base Map (B10000)	LandsD_M_03	Topographic Map	1:10,000	Arc/Info 7.2.1
LandsD	Base Map (B20000)	LandsD_M_04	Topographic Map	1:20,000	Arc/Info 7.2.1
LandsD	Land Status Plan	LandsD_M_03	Land lot status	1:1,000	Arc/Info 7.2.1
PlanD	Layout Plan	PlanD_M_01	Detailed layout plan	1:500	MicroStation J
PlanD	Layout Plan	PlanD_M_02	Detailed layout plan	1:1,000	MicroStation J
PlanD	Outline Development Plan	PlanD_M_03	Development plan	1:2,500	MicroStation J
PlanD	Outline Development Plan	PlanD_M_04	Development plan	1:5,000	MicroStation J
PlanD	Outline Development Plan	PlanD_M_05	Development plan	1:10,000	MicroStation J
PlanD	Outline Zoning Plan	PlanD_M_06	Town Planning	1:2,500	Arc/Info 8.0.2
PlanD	Outline Zoning Plan	PlanD_M_07	Town Planning	1:5,000	Arc/Info 8.0.2
PlanD	Outline Zoning Plan	PlanD_M_08	Town Planning	1:7,500	Arc/Info 8.0.2
PlanD	Outline Zoning Plan	PlanD_M_09	Town Planning	1:10,000	Arc/Info 8.0.2
PlanD	Outline Zoning Plan	PlanD_M_10	Town Planning	1:20,000	Arc/Info 8.0.2
PlanD	TPU/SB Plan	PlanD_M_11	Census geography	1:5,000	Arc/Info 7.2.1
PlanD	TPU/SB Plan	PlanD_M_12	Census geography	1:10,000	Arc/Info 7.2.1
PlanD	TPU/SB Plan	PlanD_M_13	Census geography	1:15,000	Arc/Info 7.2.1
PlanD	TPU/SB Plan	PlanD_M_14	Census geography	1:20,000	Arc/Info 7.2.1
PlanD	TPU/SB Plan	PlanD_M_15	Census geography	1:50,000	Arc/Info 7.2.1
CED	Slope Feature Plan	CED_M_01	Slope features (for CED)	1:5000	MicroStation J
WSD	Slope Record Plans	WSD_M_01	Slope features (for WSD)	1:1,000	ArcView 3.2.a

PDs	Map Series	Map Series ID	Map Style	Scale	GIS Platform
WSD	Water Main Record Plans	WSD_M_02	Water main features	1:1,000	Arc/Info 7.2.1

Table 8 - Inventory of Map Series Produced by PDs

7.3 Departmental Symbol Specification

Symbol Specification

7.3.1 It is recommended that each Category IV PD should produce a departmental symbol specification for reference purpose and to facilitate the reproduction of symbols, when required by PDs. Though most of the Cat IV PDs have currently maintained their departmental symbol specification; DAM 2 recommends that these PDs should enhance and maintain a departmental symbol specification, which contains the following items:

(a) Map Series – From which map series the datasets are symbolized, e.g. Base Map (B1000).

(b) Feature code – The code referencing to the symbolized geospatial feature, e.g. the feature code of 'BP' is used to represent the Building Polygon.

(c) Feature layer – In which layer the geospatial feature is symbolized, e.g. Building Polygon (BLDGPOLY).

(d) Feature type – Which type of geospatial feature is symbolized, e.g. point, line, polygon, or annotation.

(e) Look-up Value – Some symbol set may contain the look up table to reference the symbol file. Value and field for the look up table to be referenced should be included. E.g. The look up value of BP is 114 and the corresponding field is 'symbol'.

(f) Cartographic description – The cartographic details (size, style, colour) to describe the properties of symbols. These cartographic details described are mandatory for the re-produce of the symbols. These descriptions are recommended not in software dependent expressions.

(i) Size – Description of the size of for the point symbol and annotation. The line width (/ weight) describes the size of the line and polygon symbol (i.e. width of the polygon outline). The size of the symbols could be expressed in millimetre or inch.

(ii) Colour – Specification on the colour code (e.g. RGB, CMYK) of the symbol. PDs need to specify if no specific colour is used to represent the symbol.

(iii) Style – If the line symbols are in which line style, e.g. firm line, chain-dot line. This is also applicable to the polygon symbols when they are represented with outline symbols.

(iv) Typeface – If the annotation is in which font type.

8 DAM 3 - File Formats Standard

8.1 Overview

File compatibility problem in the exchange of PLW data

8.1.1 Worldwide, billions of dollars have been invested to produce geospatial datasets for different purposes. These datasets have been developed for a large variety of application domains, such as municipal planning, utility and infrastructure management, property management and taxation, emergency planning and management, law enforcement and environmental applications. Each of these application areas has specific requirements and the datasets have been produced in a variety of formats, targeted at specific GIS packages procured to meet the requirements of the individual departments / agencies.

8.1.2 Similar to Hong Kong, problem type CF (File format compatibility) and DF (data in digital format) are common to these departments / agencies in the exchange of geospatial data. These problem types caused a significant problem in geospatial data management. Very often, GIS users need to import geospatial data from different sources. This task is often both difficult and time consuming. Industry experts believe that 60% to 85% of the total cost of GIS implementation is data conversion. The numbers of geospatial data producers and users have grown continuously over the last two decades, and the number of application areas in which geographic information system (GIS) and geospatial information are used has increased every year. However, growth in use has not lived up to the predictions made 10 years ago, especially compared with that of other information technologies such as Internet and Office Automation.

8.1.3 One major reason for growth being slower than expected is the lack of readily available digital geospatial data, the high cost of developing new geospatial datasets, the geospatial data sharing barrier, problems integrating GIS into existing systems, and the complexity of existing GIS software. Of these, the main cause to the geospatial data exchange problem is mainly due to the fact that geospatial datasets are made available in a large variety of incompatible formats.

8.1.4 To mitigate the file format compatibility problem, solutions have been developed by academics, international standard organizations, and software vendors through the years. These include data conversion and data standardization.

8.1.5 GIS vendors have developed their own proprietary geospatial file formats, specifically designed to speed up the display, query and analysis of data in their particular systems. Vendors' solution to the geospatial data file format compatibility problem to facilitate data sharing consist of data translators that convert multi exogenous geospatial file formats into their own proprietary format. This solution provides their systems a certain level of interoperability, but this solution is not totally satisfactory:

(a) Loss of significant information and incomplete data translation

(b) Varying methods, levels of effort, and skills required by users converting the same data among different geospatial file formats

8.1.6 In the context of DAM 3, PDs will be advised on the standardization of geospatial file formats. Standardization efforts alone will not solve the geospatial data conversion, exchange, and integration problem. Data conversion tool (DCT) and infrastructure such as network file servers and data dissemination facilities are also needed to facilitate file format conversion and provide a place to store and retrieve standardized geospatial datasets.

Recent effort on Geospatial Data Standard

8.1.7 In recent years, different nations have established initiatives to encourage GIS users within their constituent departments to adhere to geospatial data standards with the intent of minimizing the number of geospatial file formats, reducing duplication of work, optimizing expenditures, and facilitating information exchange.

8.1.8 While standardization is seen worldwide as positive step toward solving the geospatial data translation and reuse problem, it will not be based on a single file format solution. It is extremely unlikely that industry will move to a single standard. What is expected, however, is that a number of standards will coexist. This is especially true when viewed in the context of the billions of dollars of legacy datasets that are in currently use, and must continue to be supported. As a result, a number of proprietary, industry's de facto standard, and open public domain digital geospatial data exchange standards have been promulgated. These standards do not eliminate the need for data conversion tools. They do, however, provide better interoperability by minimizing the number of translation paths and specifying the way information should to be exchanged.

Business need of file format standards

8.1.9 The evolving e-Government policy has accomplished to deliver IT–infrastructure good for intra-government communication and also for interaction with citizens and businesses. The 2001 Digital 21 Strategy continues to build on solid infrastructures already established for leveraging IT, to position Hong Kong as a leading e-business community and global digital city. Business need of the File Formats Standard has already been explained in the Interoperability Framework which contributes to part of the IT infrastructure and is cohesive with the e-Government initiatives to ensure that the Government leads by example and in the adoption of e-business to provide client-centric services across the boundaries of Bureaux and Departments (B/Ds).

8.1.10 Interoperability Framework (IF) is an initiative that would help to make information flow seamlessly across B/Ds' computer systems. Interoperability Framework is established to facilitate communication and integration between the systems. Under the IF, business and technical interoperability areas were defined and business need for mature standard in these areas was identified. The areas being included in the IF would focus on:-

(a) Data interchange between application systems;

(b) Interaction between the systems and some central infrastructure services (e.g. Electronic Service Delivery);

(c) The format for exchanging documents between the computer systems used by different users; and

(d) Security specifications to enable secured communications.

8.1.11 Under e-Government initiatives and the requirements of IF, there is a business need to specify File Formats Standard for exchanging Geospatial data in Planning, Lands & Works.

8.1.12 Apart from fulfilling the policy requirements to conform to the requirements of the IF, there are other benefits that File Formats Standard could bring. These include: -

(a) Cost effective exchange of geospatial data;

(b) Facilitated sharing and reuse of existing geospatial data among PDs;

(c) Reduced redundant data creation and maintenance.

8.1.13 The objective of DAM 3 is to standardize geographic data file formats and to mitigate the data exchange problems that arise from data format interoperability and compatibility issues. The scope of DAM 3 includes the following:

(a) Recommend a workable solution to standardize file format for the exchange of PLW data and such solution can be implemented within the committed timeframe. Also the solution should be able to resolve the data format issues in the data process exchange process documented in the current environment description.

(b) Select the initial set of file formats to be adopted. In the context of DAM 3, the recommended file formats will include the formats that are required to cover the five CSUs and other inter-PDs' data exchange processes documented in the current environment description.

(c) Recommend if there is a DCT package available in the market good for DAM 3 purpose.

(d) Advise PDs on the DCT specification and how the DCT tools could be deployed according to the approach and methodology of data dissemination of CSU data.

(e) Develop a programme for adoption of the file formats for exchanging data.

(f) Provide the mechanism and procedures for subsequent maintenance of the File Formats Standard.

(g) Recommend an organization and define roles and responsibilities of PDs for the implementation of DAM 3.

8.1.14 For item (f) and (g) above, the enforcement and subsequent review of the standards would be covered in Volume 2G. These two items would not be discussed in this document.

8.2 Development of File Format Standards Candidates

Alternative Approaches for File Format Standards

8.2.1 The geospatial data conversion and the associated exchange problem exist because various geospatial data products are produced in different formats. These products in different formats will continue to need to coexist and be integrated. Developments of interoperable and open solutions are heading in the direction of intelligent data agents (or data brokers, a facilitator between data suppliers and data users that utilize programming techniques for automatically finding, accessing, and /or reformatting user specified dataset) that will enable future systems to use data in industry standard and open data file formats directly, e. g. via virtual internal translations[5]. In the future interoperable GIS solution, once a desired source dataset is identified, it may be accessed directly by the data agent / data broker across a distributed file system. The virtual internal translation will enable the accessing software to directly read and translate the dataset into desired format, projection and datum. The resulting dataset can be used directly within a GIS application. Therefore, no human intervention or intermediate exchange file formats will be needed. The future interoperable GIS solutions will be "multi-lingual". They will access data files and databases directly over data networks. They will read and write popular file formats directly. The above intelligent agent would require an IT infrastructure which is more affordable in DAF.

8.2.2 In the context of DAM, we will take a pragmatic approach. Five alternative approaches had been reviewed to address the file compatibility problem in the exchange of PLW data:

(a) Approach 1: Work with existing data format conversion and exchange workflows - Identify the best currently owned technologies to improve and optimize individual PD's technical processes.

(b) Approach 2: Work with existing data format conversion and exchange workflow - Recommend tools and technologies of data exchange to improve the process.

(c) Approach 3: Modify the data format conversion and exchange workflows and technology to consolidate the technical processes - Identify tools

[5] Virtual Internal Translation is an automated software methodology that: 1) Accesses metadata encoded within source datasets to determine their formats, projections, and datum and 2) translates the datasets to a new target format, projection and / or datum.

required to support a common standard intermediate data exchange format.

8.2.3 Approach 4 and Approach 5 are similar to Approach 3, except that these two approaches will assume the exchanged datasets to be logged within a single common (or multiple PD owned and distributed) metadata catalog(s) and data storage facility or facilities. These approaches are more relevant in the context of DAF and would therefore not further reviewed in DAM 3.

8.2.4 The need for common file format standard is driven by its business need and if there are tools available in the market good for conversion purpose, Approach 3 is preferred.

8.2.5 The Final Solution of DAM 3 recommends consolidating data exchange to a minimum set of popular industry standard file formats (The Approach 3). In addition, Data Agents (the physical PD, not an "intelligent" one) lacking the infrastructure for supporting data conversion to /from the minimum set of formats are advised to consider adopting a Data Conversion Tool (DCT). This approach is non-disruptive and will assure that HKSAR Government is headed on a path compatible with the expected future developments in interoperable open GIS and geospatial solutions.

Practice of File Format Standards in some developed countries

8.2.6 The Permanent Committee on GIS Infrastructure for Asia Pacific and the University of Melbourne published the *Report of Analysis of Regional Fundamental Dataset Questionnaire* in 2000. This report examined the developments of fundamental geo-referenced datasets of 16 countries in the Asia Pacific Region. Among the 16 surveyed countries, four countries developed (or were planning to develop) National Standard for Geospatial Data Exchange. Table 9 below summarizes the report findings.

	Data Exchange Standard (Y/N)	Standard File Format adopted for exchange of geo-spatial data
Australia	No	Proprietary Formats are used for data exchange (Arc/Info, MapInfo, DXF)
China, People R. of	Yes	Related National Standard is going to be issued. Note: Geo-spatial data transfer format (GB/T 17798 - 1999) was implemented in Oct., 2001
Iran I. R. of	No	-
Japan	No	-
Kiribati	No	-
Laos	No	-
Macau	No	-
Malaysia	No	-
Maldives	No	-

Mongolia	No	-
Nepal	Yes	Arc/Info Export; DXF
New Zealand	Yes	GINA; ASCII; IFF (Laserscan's Internal Feature Format – ASCII)
Palau, R. of	No	-
Singapore	Yes	SIF (Intergraph's Standard Interchange Format); DGN; DXF; Arc/Info
Soloman Island	No	-
Tuvalu	No	-

Table 9 National Standard for Geospatial Data Exchange developed by other countries

8.2.7 The report identified that about 83% of the surveyed countries engaged in data exchange; however, none of these countries have their own developed national standard for data exchange File formats being used by those countries surveyed include ASCII, DXF, ARC/INFO, DWG and DGN. Moreover, the report identified that all the surveyed countries could provide data in both GIS (e.g. Arc/Info) and CAD formats (e.g. DWG, DXF, and DGN).

8.2.8 While the survey focuses on the countries in Asia and the Pacific region, there are developed countries in North America and Europe, such as United States and United Kingdom, who have developed their own national data exchange standards.

	Standard File Format adopted for exchange of geo-spatial data
United States	Spatial Data Transfer Standard (SDTS)
Canada	Spatial Archive and Interchange Format (SAIF) Canadian Council on Geomatics (CCOG) Interchange Format (CCOGIF)
United Kingdom	Geography Markup Language (GML) v2.0
Other European Countries	GDF (Geographic Data Files); DIGEST (Digital Geographic Information Exchange Standards);

Table 10 Standard File Formats for geospatial data exchanges developed by Western countries

8.2.9 Apart from the national standards, significant initiatives have been taken to address the geospatial interoperability issue. These initiatives have attempted to transcend geospatial data standards and provide more complete interoperable solutions. Complementing the various national initiatives on spatial data infrastructures, three important interoperable frameworks are under development:

(a) ISO/TC 211. ISO/TC 211, is an international effort establishing industry and world geomatic standards. TC 211 is designed to provide a politically neutral forum for all proponents to align their respective standards.

(b) OGIS. The Open GIS Consortium is an open forum for the GIS community to share ideas and contribute to the development of interoperable geospatial data and operations.

(c) DGIWG. The Digital Geographic Information Working Group (DGIWG) promotes the use of DIGEST by providing a set of freeware tools, interoperability over geospatial data, direct and transparent access (platform and projection independent) to DIGEST-compliant data, and a worldwide data access through communications networks (Internet / Intranet, local and wide area networks).

8.2.10 While there are national and international standards in place in some countries, in practice these standards are not used much. As a practical matter, governmental agencies at all levels tend to develop, publish, and exchange geospatial datasets pragmatically using a few well-known proprietary formats. Thus, there exist de facto standards of geospatial data exchange relying on proprietary formats such as ESRI's compressed coverage (E00) format, ArcView Shapefiles, MapInfo Interchange File (MIF), and Design files (DGN). There are, however, emerging open file formats such as the Open GIS Consortium's Geographic Markup Language (GML) format that show great promise for the future.

8.2.11 Following the technical trends and international practices, there are two mainstreams of standards of geospatial data exchange: standardization via proprietary formats (such as DXF) and open file formats (such as GML). This project reviewed and evaluated the candidates of proprietary and open file format standards and the results are discussed in below sections.

8.2.12 File formats are divided into three major categories and separated by whether they are proprietary or open file formats. The three categories include the following:

(a) Geospatial file formats

(b) Attribute file formats

(c) Other data file formats

8.2.13 Geospatial file formats store spatial data. Attribute file formats store information about spatial data and may include a number of different data types such as text, integer, float, and blob. Other data file formats are neither geospatial nor attribute. Examples of this type of data are metadata and textual data (i.e. data does not link to geospatial data).

8.2.14 In DAM 3, we have reviewed a number of common proprietary file formats for geospatial data, including those formats recommended in the PLW Study. We have also reviewed other open file formats which are supported, varying in extent, by different GIS software. The file formats are:

(a) Proprietary Formats:

(i) ArcView SHAPEFILE (geospatial);

(ii) Arc/Info Coverage (E00) (geospatial);

(iii) MapInfo Interchange File (MIF)(geospatial);

(iv) Interactive Graphics Design System[6] (IGDS or DGN)(geospatial);

(v) AutoDesk's DWG[6] (Drawing) / DXF (Drawing Exchange Format) (geospatial);

(vi) ESRI's Arc/Info Generate File (geospatial)

(b) Open File Formats:

(i) Extensible Markup Language (XML) (attribute);

(ii) Geography Markup Language (GML)(geospatial);

(iii) Spatial Data Transfer Standard (SDTS)(geospatial);

(iv) Federal Geographic Data Committee (FGDC)(other – metadata);

(v) American Standard Code for International Interchange (ASCII)(attribute);

(vi) Extended Binary-Coded-Decimal Interchange Code (EBCDIC)(attribute);

(vii) Spatial Archive and Interchange Format (SAIF)(geospatial)

File Format Standards candidates for Geospatial Data

8.2.15 With the information gathered from the stock taking of data exchange processes carried out in March, 2003, the following tables summarize the file formats currently adopted by the PDs in their geospatial dataset exchanges related to CSU datasets.

(a) Destination (i.e. converted) formats of data exchange processes by the percentage of total exchange processes:

Destination formats of data exchange processes	Percentage of total exchange processes
DGN	37%
DWG / DXF	8%
E00	25%
Arc/Info Coverage	11%
ArcView SHAPEFILE	10%
ArcSDE	8%
MIF	1%

[6] For IGDS, DWG and DXF, attributes would be stored and maintained in separated file(s).

Table 11 Geospatial file formats by Data Exchange Processes

(b) Number of PDs and percentage of total PDs receiving a particular destination formats in geospatial data exchanges.

Destination formats of data exchange processes	Number of Receiving PDs	Percentage of Total Receiving PDs[7]
DGN	8	73%
DWG / DXF	3	27%
E00	8	73%
Arc/Info Coverage	5	45%
ArcView SHAPEFILE	4	36%
ArcSDE	2	18%
MIF	1	9%

Table 12 Geospatial file formats by receiving PDs

8.2.16 In addition to the statistics from the above tables, other factors were also considered in the preliminary evaluation of the above file formats standard. These factors include user requirements, availability of conversion tools, data quality and integrity, and resource implication. The evaluation results suggested that the following proprietary file formats were selected as candidates of file formats standard:-

(a) Arc/Info Coverage (or E00);

(b) SHAPEFILE; and

(c) DXF

(d) Since DGN is also used by most of the PDs (e.g. DSD, WSD, CED and HyD etc.), DGN is also considered as a file format standard candidate.

8.2.17 Apart from the proprietary formats discussed above, **GML** was recommended as a candidate of open file format standard.

[7] BD and LR do not request geospatial data as in the current practices, BD and LR are excluded from the total receiving PDs.

File Format Standard candidates for Attribute Data

8.2.18 While the data is exchanged in any of the above recommended format, (e.g. DGN and DXF), attributes could be linked and maintained in separated file(s). The candidates of file formats could be selected from those used in the current practices. As identified from the stock taking exercise, the distributions of file formats used by the PDs are as follows.

(a) Destination Formats of the attribute dataset:-

Destination formats of attribute dataset	Percentage of processes
ASCII (Formatted Text)	50%
DBF IV	19%
EXCEL	11%
Oracle	17%
Visual FoxPro	3%

Table 13 Attribute file formats by Data Exchange Processes

(b) Number of PDs and percentage of PDs receiving attribute datasets in each of the formats:

Destination formats of attribute dataset	Number of Receiving PDs	Percentage of Total Receiving PDs
ASCII (Formatted Text)	10	77%
DBF IV	6	46%
EXCEL	7	53%
Oracle	3	23%
Visual FoxPro	1	8%

Table 14 Attribute file formats by receiving PDs

8.2.19 Although Oracle is a commonly used back-end database systems of PDs, Oracle dump file is proprietary and version dependent and is not a suitable file format for data exchange. Apart from Oracle, Excel is a spreadsheet format and cannot be considered as a rigorous database format and FoxPro is currently used by PlanD only. Attribute files should be associated with graphic elements in CAD Drawings (e.g. DGN and DXF). Given the current CAD environment among the PDs (i.e. MicroStation and AutoCAD), DBF IV and ASCII (i.e. formatted text) are the most commonly used formats and are supported by current available versions of the CAD softwares among the PDs (e.g. MicroStation 95, SE). Hence, ASCII (i.e. formatted text) and dBase IV are recommended as candidates of file formats standard for attribute information.

8.2.20 Attributes could be linked and maintained in the following file formats:

(a) ASCII[8] (i.e. formatted text); and

(b) dBase IV (i.e. DBF)

8.2.21 Apart from the above mentioned file formats currently used by PDs for data exchange, PDs have developed internal systems using MS Access which produce data in Access MDB format (e.g. ArchSD, CED, HyD and WSD). Since MS Access is mainly used internally within PD, but not used in the data exchange process, Access MDB was not documented in the stock taking of data exchange processes. Nevertheless, MS Access could be a possible file format standard candidate. Hence, in addition to ASCII and dBase IV, Access MDB was also evaluated.

8.2.22 XML is becoming a common data exchange format. However, in the current CAD environment of the PDs, neither AutoCAD nor MicroStation support direct database connection to XML. As such, XML is not chosen as a candidate.

File Formats Standard candidates for Other Data

8.2.23 The prime objective of DAM 3 is to recommend the File Formats Standard for PLW data exchanges. Formats for other data files, e.g. textual data that do not link with geospatial data, are not covered by the recommended standard. Excepting metadata standard which is recommended in DAM 5, file formats for other data should follow the recommendations of the Interoperability Framework (IF) of HKSAR Government. Hence, to comply with IF, textual data should be exchanged using XML.

8.2.24 Nevertheless, as suggested in other interoperability areas in IF (e.g. Spreadsheet and Presentation Files), Bureau / Departments may, upon the interacting parties' agreement, specific formats other than XML could be used for intra-government exchange.

8.3 Evaluation of DCT

Application Areas of DCT

8.3.1 The following candidates of Standard File Formats were recommended from section 8.2:

(a) Candidates for Proprietary Format for Geospatial Information file format: Arc/Info (E00), ArcView SHAPEFILE, DXF and DGN.

(b) Candidates for Open Format for Geospatial Information: Geography Markup Language (GML). GML is an emerging format. GML 2.0 was firstly recommended by OGC in February 2001 and two version upgrades (GML V2.1.1 and V2.1.2) were announced subsequently. The current

[8] Currently, these ASCII text files are formatted differently by different departments (e.g. by Comma Separated Values – CSV and Tab Separated Values – TSV). If ASCII text files is chosen as the File Format Standard in the next stage of evaluation, a standardised ASCII format would be recommended.

version is GML 3.0 that was issued in January 2003. As it evolves, improves, and matures, commercial vendors are expected to incorporate full support for GML into their interoperable GIS product. Despite the technological developments to promote GML to become a single interoperable standard for data exchange, GML is still in its developing phase. GML will be further evaluated in section 5 to determine if this is a suitable time for the PDs to migrate to GML.

(c) Candidates for Format for Attribute Information: ASCII (i.e. formatted text), dBase IV and MS Access (i.e. MDB) are the candidates of file formats for attributes.

8.3.2 Other data file formats are not covered in the DAM 3's File Formats Standard. Nevertheless, it is understood that Interoperability Framework recommends other data file formats (e.g. XML), including textual information that does not link to geospatial data.

8.3.3 In the context of DAM 3, the following Figure 25 illustrates the application areas of the DCT recommended for exchange of geospatial data. When a process relates to the exchange of proposal or as-built drawings in Works projects, the process will be recommended to follow the standards defined in the CSWP.

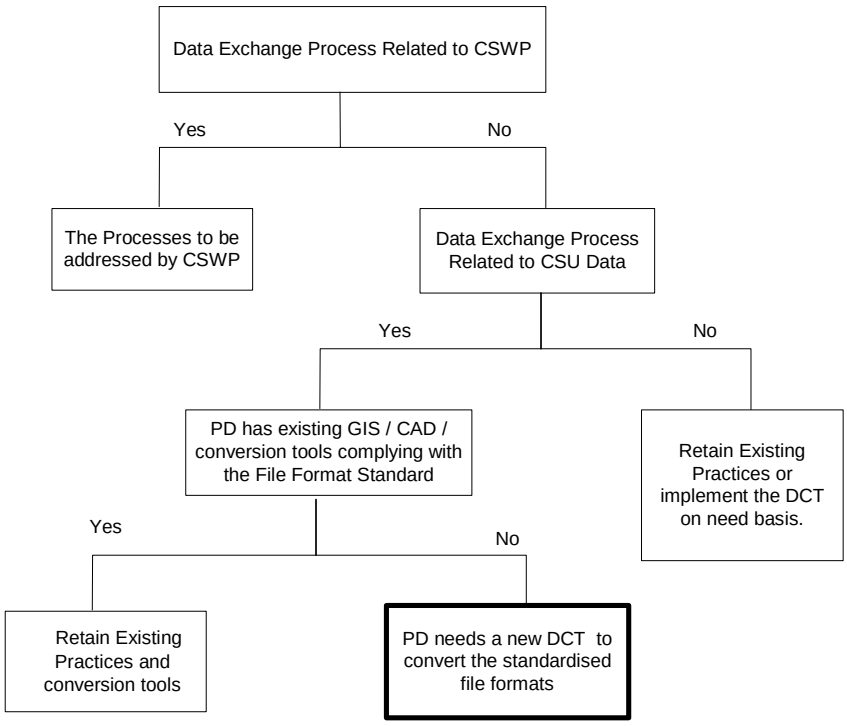


Figure 25 Application Areas of new DCT

8.3.4 As part of the analysis process, a DCT evaluation was carried out to see if there is a DCT available in the market that could be used to convert geospatial data from a proprietary format to the recommended file formats standards candidates and vice versa. The DCT is required to handle the conversion of geospatial information

as well as the associating attributes only (e.g. attributes which are linked to graphic elements and stored in external database files).

8.3.5 As a related issue on data conversion, CSU data when exchanged in DGN format, if it is an adopted file format standard, should conform to the layer naming standard set in latest published version of CSWP. HPLB will follow-up with CSWP on its layer naming standard.

Requirements of DCT

8.3.6 Requirements of the DCT are summarized as follows:-

(a) Support CSU data exchange via recommended open formats; and

(b) Support CSU data exchange via recommended proprietary formats.

8.3.7 Conduct the data conversion with high quality with respect to geometric accuracy of spatial feature, correctness and completeness of features converted, correctness of attribute information associated with geometry converted. The linkage between graphic entity and attribute information must be maintained correctly and completely.

8.3.8 Two products: FME and GeoMedia were evaluated with the pre-defined requirements and test cases.

8.3.9 FME fully complied with the requirements of geospatial data reformat. Having the same limitation as was experienced with other tools, FME failed to convert Chinese Annotation in EUC font. According to the supplementary information provided by the vendor, FME could be customized to convert EUC font to Big-5 font as well as other software platforms and font sets.

8.3.10 Since annotations are currently not included in the five CSUs, it was concluded that there is DCT package available in the market that supports CSU data exchange via the candidates of file format standard, such as FME. Nevertheless, to adopt DCT to non-CSU data containing Chinese Annotations, extra customization efforts might be required.

8.4 Recommendation of File Format Standards

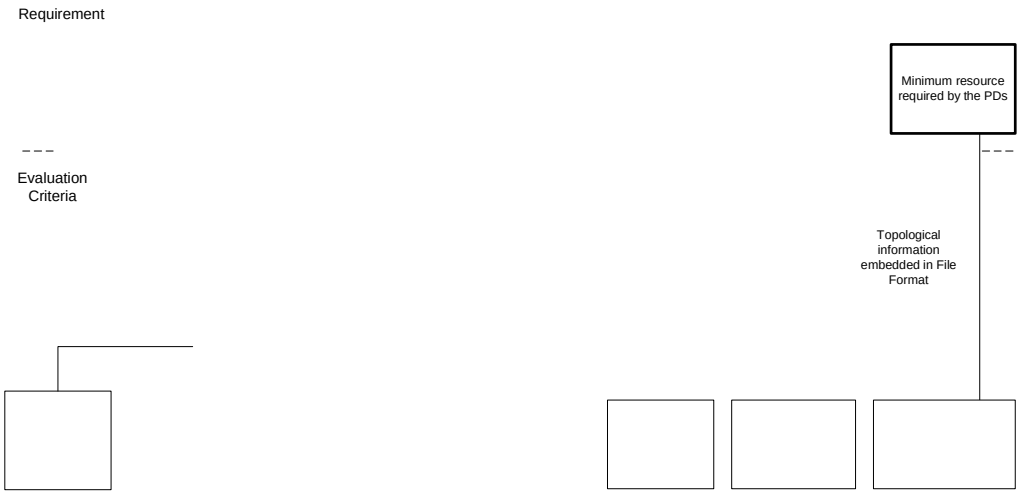
Evaluation Criteria of File Formats Standard

8.4.1 The same guiding principles for defining the technical specifications for each interoperability area in the Interoperability Framework (IF) are adopted for DAM 3 purpose. These include:

(a) The specifications should be mature and widely adopted, internationally recognized or de facto standard;

(b) As far as possible, open standards that are vendor and product neutral;

(c) The number of selected specifications should be minimized but offering an appropriate level of flexibility to the Data Owners and Data Users;


Requirement
Minimum resource required by the PDs
Evaluation Criteria
Topological information embedded in File Format

PDs' " might have to compromise with the requirement "Align with industrial / International / Local Standard". In the DAM context, the following requirements are considered to be high priority:-

(a) Minimum resources required by PDs;

(b) Data Quality; and

(c) Minimum impact to the PDs' current systems.

Requirements of File Formats Standard for Attributes

8.4.5 DAM 3 would also recommend the File Formats Standard of attributes associating with geospatial data. Similar to geospatial data, areas of requirements and evaluations criteria are specified according to the guiding principles from IF in the context of DAM. The requirements and evaluation criteria are as follows:-

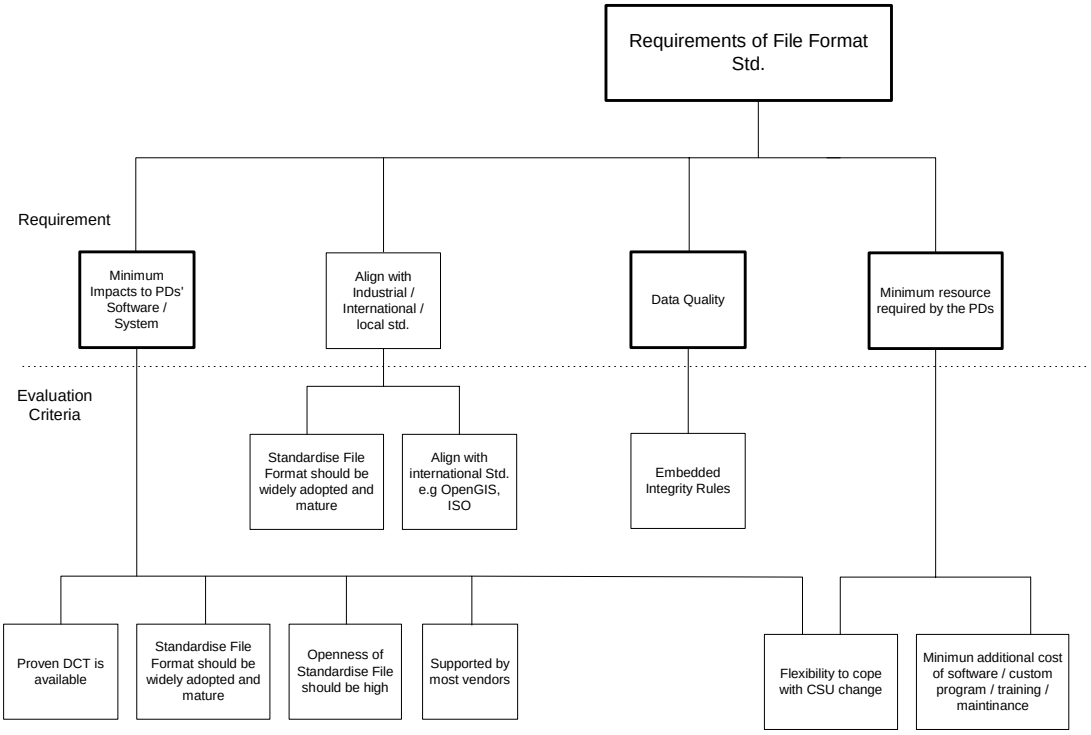


Figure 27 Requirements of File Formats Standard for Attributes

8.4.6 Similar to Geospatial data, the following requirements for attributes are considered to be high priority:

(a) Minimum resources required by PDs;

(b) Data Quality; and

(c) Minimum impact to the PDs' current systems.

8.4.7 Adhering to areas of requirement specified above, the candidates of File Formats Standard were evaluated. File formats for geospatial information and attributes were evaluated separately. The evaluation is supported by the information extracted from the stock taking of data exchange processes.

File Formats Standard for Geospatial Information

8.4.8 The following table summarizes the results of the evaluation. Details of the evaluation is in Appendix O of Volume 3B.

	GML	E00	ArcView SHAPEFILE	DXF with Attribute	DGN with Attribute
Minimum impacts to PDs' Software System	Low Compliance	High Compliance	High Compliance	Low Compliance	High Compliance
Minimum resource required by PD	Non-Compliance	Full Compliance	Low Compliance	Low Compliance	High Compliance
Data quality and completeness	High Compliance	High Compliance	High Compliance	Low Compliance	Low Compliance
Align with Industrial / International / Local Standard	High Compliance	High Compliance	High Compliance	Low Compliance	Low Compliance
Support geospatial characteristics	Low Compliance	High Compliance	Low Compliance	Low Compliance	Low Compliance
		Recommended			**Recommended**

Table 15 Evaluation of File Formats for Geospatial data

8.4.9 E00 and DGN are the recommended initial set of File Formats Standard for geospatial information. Key rationale and benefits of the recommended standard are highlighted as follows:-

(a) Both GIS and CAD data could be handled in the recommended standard. This combination complies with the IF's guideline that the number of selected specifications should be minimized but offering an appropriate level of flexibility to the both GIS-user PDs and CAD-user PDs.

(b) ArcView SHAPEFILE is a commonly used file formats for geospatial data. Though this format could be used directly in most GIS platforms, one major drawback of ArcView SHAPEFILE is that it does not support annotation. As part of the map production process, cartographers would usually need to use human judgment and spend considerable human effort to "custom make" annotation (e.g. the cartographer would choose to re-position the annotation from a centroid of a polygon to the interior of building outline; he could also choose to improve the "look & feel" of the annotation on the map layout.) One possible remedy with SHAPEFILE is to re-generate the annotation using GIS packages that come with powerful label placement capabilities, but the produced results might be different from the original annotation. The effort spent by the map producing PDs could not be salvaged for other PDs use. In viewing that the File Formats Standard of DAM 3 should support exchanges of all PLW Data in the processes document in the current environment description, annotation

should not be excluded and as such ArcView SHAPEFILE is not recommended to be included in the standard.

(c) E00 and DGN are the dominant file formats (the combination is supported by most PDs) of GIS-user and CAD-user PDs. Most PDs could adopt the standard easily without significant additional resource implication. Comparing with Arc/Info Coverage, E00 is a better file format for data exchange. E00 is an Arc/Info Coverage that had been converted to an ASCII text file. It is accessible to Arc/Info systems on different platforms. Moreover, E00 offers better integrity of data than Arc/Info Coverage files since all sub-files of an Arc/Info Coverage are wrapped into a single E00 file.

(d) GML is a promising file format for geospatial data exchange. GML complies with international standard and indicates no preference on any proprietary software. However, we would not recommend to include GML as a standard at this stage. One reason for not recommending GML as a Standard File Format is that it is an emerging standard currently under development and is not widely supported with adequate DCTs for use by PDs. The new version of GML 3.0 (just recently released) supports topology and when compared GML 2.0, the file size is smaller. Despite the improved capabilities in GLM 3.0, it does not support annotation. We recommend the DAM Management Committee should keep in view of the development of GML until it comes to a mature stage that GML can be fully supported by GIS software platforms currently used by the PDs.

File Formats Standard for Attributes Associating with Geospatial data

8.4.10 Attributes associating with Geospatial data can be stored in files separated from the spatial and georelational data files of the GIS (e.g. DGN and E00 respectively). That is most CAD and GIS platforms leverage Microsoft's Open Database Connection Technology (ODBC) to relationally join via a common key field to relate attribute data records stored in external files with spatial data records of the native CAD and GIS data file formats. This section suggests the file format for such collections of attribute data. The following table summarizes the results of the evaluation. The following requirements are made throughout the evaluation:-

(a) The file format should be supported by GIS / CAD / DBMS software commonly used by the PDs;

(b) The file format should facilitate the linkages of the attributes with graphic information in GIS-based geospatial datasets and CAD drawings; and

(c) The evaluation considers the most commonly used CAD software of PDs, which are AutoCAD and MicroStation.

8.4.11 The evaluation of the three candidates is summarized in the table below. Details of the evaluation is in Appendix O of Volume 3B.

	Dbase IV	ASCII (i.e. CSV)	MDB
Minimum impacts to PDs' Software System	Full compliance	Low Compliance	High compliance
Minimum resource required by PD	Full compliance	Low Compliance	Low compliance
Data Quality	High compliance	Low compliance	Full compliance
Align with Industrial / International	Low compliance	Non- compliance	Low compliance
	Recommended		

Table 16 Evaluation of file formats for attributes

8.4.12 MDB is a widely accepted file format adopted by PDs. When compared with DBF IV and ASCII (i.e. CSV), the MDB format offers better data integrity since all database tables as well as the relationships are wrapped into one single database file. Moreover, many current and future versions of GIS support MDB, and therefore it could be a good candidate of the File Formats Standard. However, MDB might not be supported by older versions of GIS software and software running on UNIX platform (e.g. Arc/Info 6.x of LandsD; Arc/Info 7.x of PlanD and WSD). Resources needed to revamp the PDs' existing systems to support MDB would be huge. Hence, MDB is not recommended.

8.4.13 ASCII (i.e. CSV) is widely adopted to exchange textual information amongst PDs. However, CSV is neither supported by AutoCAD nor MicroStation to associate attributes to geospatial data in CAD drawings. To establish the association between attributes and CAD drawing, CSV should be connected via ODBC or be converted to other formats such as DBF or MDB. These extra procedures incur additional workload to PDs. Moreover, data quality is not guaranteed using CSV. CSV does not contain information of data structure such as number of fields, field names and field types for quality checking purpose. Hence, CSV is not selected as the File Formats Standard.

8.4.14 DBF IV is a rather "old" format, but it is still a de facto industry standard and has been widely adopted by PDs in the data exchange (CAD-user and GIS-user PDs are able to import / export DBF with no requirement for additional resource. Dbase IV (DBF) is recommended as the initial set of File Formats Standard for the attributes associating with geospatial data.

8.5 Specification for File Formats Standards

8.5.1 Whilst E00, DGN and DBF are recommended as the File Formats Standard, this section recommends the specified versions of the file formats. The recommended version of file format should be supported by most of (if not all) the PDs' Systems and Software. The inventory of PDs' software platforms are summarized below:

PD	System	Software	Version	Supported Versions of E00 and DGN
ArchSD	CAD	AutoCAD	2000	N/A
C&SD	Digital Mapping System	Arc/Info	8.1	E00 (exported from Arc/Info Coverage version 7.x)
CED	Slope Information System	MicroStation	J	DGN v7.0
	Geological Modelling System	ArcGIS	8.x	E00 (exported from Arc/Info Coverage version 7.x)
	Computerised Slope Register and Location Plan System	MicroStation	J	DGN v7.0
		Geographics		DGN v7.0
		ArcView	3.2a	E00 (exported from Arc/Info Coverage version 7.x)
DSD	AM/FM	Framme	04.00.06.07	DGN v7.0
EMSD	Pilot GIS	ArcView	3.2a	E00 (exported from Arc/Info Coverage version 6.x & 7.x)
HyD	Road Data Maintenance System	Arc/Info and ArcSDE	8.1.2	E00 (exported from Arc/Info Coverage version 7.x)
		MapInfo	5	E00 (exported from Arc/Info Coverage version 7.x)
LandsD	Computerised Land Information System (CLIS)	AutoCAD	2000I	N/A
		MicroStation	J	DGN v7
		Arc/Info	6.x	E00 (exported from Arc/Info Coverage version 6.x)
	SMRIS	Arc/Info	8.x	E00 (exported from Arc/Info Coverage version 7.x)

PD	System	Software	Version	Supported Versions of E00 and DGN
PlanD	Town Planning Information System	Arc/Info	7.1.2	E00 (exported from Arc/Info Coverage version 7.x)
		ArcMap	8.1	E00 (exported from Arc/Info Coverage version 7.x)
RVD	Property Master System (PMS) and Interim Valuation System (IVS)	Arc/Info and ArcSDE	8.2	E00 (exported from Arc/Info Coverage version 7.x)
WSD	Digital Mapping System	Arc/Info	8	E00 (exported from Arc/Info Coverage version 7.x)
		SDE	3.2	E00 (exported from Arc/Info Coverage version 7.x)
		ArcView 3.2a	3.2A	E00 (exported from Arc/Info Coverage version 7.x)

Table 17 Supported Versions of E00 (Arc/Info Coverage) and DGN by PDs' current CAD and GIS Systems

8.5.2 Specifications on initial set of file formats standard are summarized below:

(a) E00 (Exported from Arc/Info Coverage Version 7.x)[9];

(b) DGN v7 (3D[10]) with attributes storing in separated files;

(c) Other specifications:

(i) Linking DGN Drawing with attribute file: DGN Drawing should be linked with the attribute files (i.e. dBase IV file) using MSLINK. MicroStation use the field MSLINK to link up a graphic element with a row in the attribute file. Hence, the attribute file must contain a numerical field called MSLINK.

(ii) Character Set: As specified in IF, English Characters should be encoded in ASCII or EBCDIC (for mainframe to mainframe data exchange). Chinese Characters (e.g. annotation, attribute) should be encoded in Big 5 or ISO 10646-character set encoded in UTF-8.

[9] To minimize the post-processing effort in CSU exchanges, the E00 file is recommended to be a single file (exported from a seamless database) rather than numerous E00s exported from tile-based map data.

[10] It is understood that LandsD provides basemap in DGN with settings for three-dimensional (3D) drawings. The setting (i.e. 3D) is for elevation (i.e. z-value) of contour lines. On the other hand, as specified in CSWP, 3D DGN should be used for CAD Drawings exchange amongst Works Departments. In viewing that both the LandsD and Works Departments exchange DGN using the settings for 3D, 3D DGN is recommended in the File Formats Standard.

For further details, please refer to the Character sets and Encoding under Domain 3: Information Access and Interchange of Interoperability Framework (IF) version 1.0.

(iii) Coordinate System: Coordinates of geospatial data should be in the Hong Kong 1980 Grid.

(iv) Layer Naming for CSU data prepared by Data Agents in DGN format: the layer naming should conform to the published CSWP requirements in layer naming and element codes, when available.

8.6 Implementation

Recommended Mode of Adoption (RMA) of file format standards

8.6.1 It is recommended that implementation of the File Formats Standard should comply with the principle laid out in the Interoperability Framework (IF). IF defined the Compliance Policy for the new system and existing systems of B/Ds:-

(a) All new e-government infrastructure systems, new government to public systems, and new inter-B/D systems should be developed based on the IF;

(b) All other new systems are strongly recommended to conform to the IF; and

(c) All existing systems should conform to the IF only when there is a new requirement for government to public integration or inter-B/D integration, and only in respect of the modifications that specifically related to external interfaces.

8.6.2 The PDs' existing GIS and CAD Systems belong to the category as of 6.1.1 (c). As defined, these existing systems should comply with the IF only when there is a "new requirement" for system integration. Under the scope of DAM Project, the incurred new requirements include:-

(a) As recommended in DAM 1, CSU data would no longer be exchanged directly between Data Owners and Data Users. CSU data would be centrally disseminated by the Data Agents. Moreover, exchange of CSU dataset would be entirely new in terms of data model, CSU ID, attribute list and workflow. It is also likely that the Data Agent of the CSU would have to revamp or develop their own IT infrastructures for data dissemination purpose. In this regard, the new CSU data exchange processes would be considered as "new requirement" and PDs' existing GIS and CAD system should comply with the File Formats Standard. Nevertheless, the new CSU data exchange processes would apply to the PDs of the DAM Project only.

(b) For non-CSU data exchange processes between PDs, the same principle applies.

(i) If they need to implement new systems for the data exchange process and the exchange involve only PDs, then compliance with

File Formats Standard is required, unless there are reasons that it may not be feasible to comply with the recommended standard file format standard due to budget, time, and contractual constraints.

(ii) There are situations that file format standards could resolve problems in the data exchange using the existing system. If applicable, PDs are recommended to develop a programme to adopt the file format standard.

8.6.3 A decision tree for determining when File Formats Standard should be adopted is presented in Figure 28. The decision tree is applicable to those PLW Data Exchange Processes relating to DAM 3, but the decision tree will not apply to those processes that could be handled within the context of CSWP, i.e. processes relating to CAD information exchange for the construction industry should comply to CSWP as per IF requirement. (Please refer to Section 1.2 of CSWP Document for CSWP details.) In the decision tree, there are three Recommended Mode of Adoption (RMA).

(a) RMA 1 is the mode for the adoption of the File Formats Standard. There are three scenarios in which RMA 1 is recommended:

(i) Scenario 1: When the Data Exchange Process is related to CSU data and there is a need for the file format conversion;

(ii) Scenario 2: When a PD develops a new system for non-CSU data exchange process;

(iii) Scenario 3: When there is a problem in the exchange of non-CSU data between existing systems of PD, and the problem could be solved by File Formats Standard.

(b) RMA 2 is the mode to maintain their current practices. RMA 2 is recommended when the Data Exchange Process is related to non-CSU data and such process involves only existing systems and there is no file format conversion problem in the process

(c) RMA 3 is the mode recommended for PDs to solve the data exchange problem by other means. RMA 3 is recommended when there is file format conversion problem in a non-CSU data exchange process using existing systems, but the problem is due to other causes that could not be resolved by the File Formats Standard.

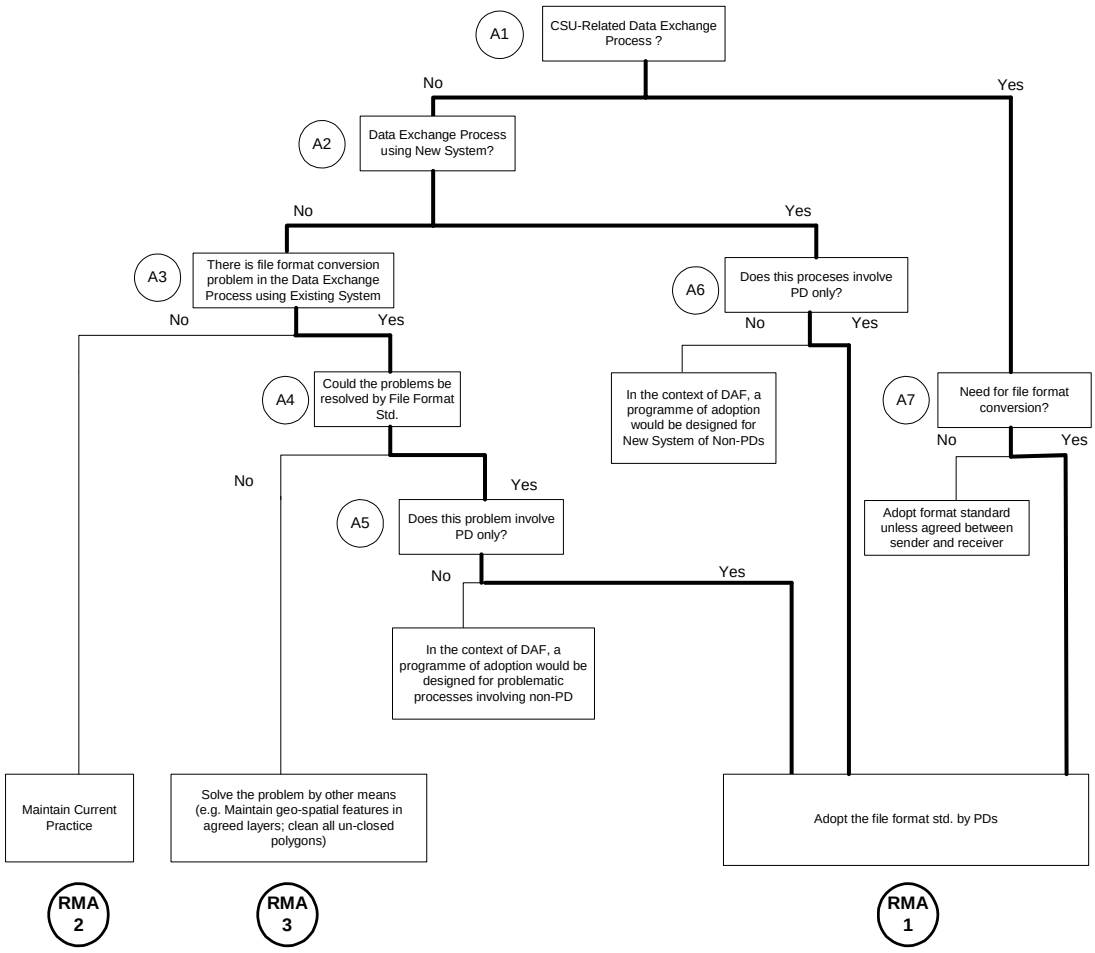


Figure 28 Decision Tree for the adoption of File Formats Standard

Adoption of File Formats Standard

8.6.4 The above decision tree analysis suggests that File Formats Standard recommended in DAM 3 should be adopted under the following scenarios (for RMA 1):-

(a) Scenario 1: CSU data exchange processes;

(b) Scenario 2: Non-CSU data exchange processes between PDs using new systems; and

(c) Scenario 3: Non-CSU data exchange processes between PDs using existing systems and there are file format compatibility problems in these processes.

8.6.5 Based on the findings from the current environment description and the later review, there were 43 processes included in the scope of DAM 3. Among the processes, there are 11 processes that could be handled within the context of CSWP. The processes include exchange of drawings:

(a) Among Works Departments,

(b) From Works Departments to LandsD, and

(c) From Works Departments to PlanD.

8.6.6 It was identified that category (a) could be handled within the context of CSWP. For the current processes exchanging hardcopies (i.e. ArchSD03~04, DSD02, HyD06, HyD07, HyD09, LandsD02, WSD04), the data providers are recommended to provide CSWP-complied digital CAD drawings. It would reduce the efforts spent by the data receivers to manually digitize information from the hardcopies. For categories (b) and (c), currently there is no agreed CSWP class and layer for proposal drawings and as-built drawings, submission of which is a routine data exchange from Works Departments to LandsD / PlanD. There could be a potential application area in the layer naming defined in CSWP to improve the data exchange in this context. The subject is already forwarded to CSWP Working Group for follow up action as stated in 4.1.4(a)(ii). Currently these drawings are either submitted in hard copy format or in soft copy format. We already made recommendation to CSWP Working Group that all proposal drawings and as built drawings should be exchanged in digital format and the soft copy should conform to the latest published CSWP requirements. The progress details on CSWP compliance requirement for proposal drawings and as built drawings would be reported in the Situation Analysis Review. While at the same time, we would recommend to CSWP Working Group if the processes ArchSD03~04, DSD02, HyD06, HyD07, HyD09, LandsD02, WSD04 could be replaced with electronic data exchange processes.

8.6.7 The evaluation result of the remaining processes after the decision tree analysis is summarized below, as CSU and non-CSU data exchange processes:

CSU data exchange processes

8.6.8 19 Processes belong to this catalogue (Appendix M.3). Recommended Mode of Adoption 1 (RMA 1 – Adoption of File Formats Standard) is recommended for the processes. Under the future workflow recommended in DAM 1, digital data should be exchanged via Data Agents. Respective File Formats Standard for the CSU-data exchange processes (except C&SD05, 08 and RVD02) are suggested as follows:-

Existing Processes		**CSU Data Exchange Process**				
Process ID	**Data Exchanged**	**Data Owner**	**File Formats to Data Agent (From Data Owner)**	**Data Agent**	**File Formats to Data User (From Data Agent)**	**Data Uses**
ArchSD09	Land Lot layout plans	LandsD	N / A	LandsD	E00, DGN & DBF	ArchSD
C&SD01	Base Map	LandSD	N / A	LandsD		C&SD
C&SD03	Cadastral map include	LandSD	N / A	LandsD		C&SD

Existing Processes		CSU Data Exchange Process				
Process ID	**Data Exchanged**	**Data Owner**	**File Formats to Data Agent (From Data Owner)**	**Data Agent**	**File Formats to Data User (From Data Agent)**	**Data Uses**
	land lot polygon					
C&SD04	TPU / SB Boundary	PlanD	N / A	PlanD		C&SD
C&SD05	OP documents	BD	Follow the recommendations in IF[11]	LandsD		C&SD
C&SD08	BD MD	BD	Follow the recommendations in IF	LandsD		C&SD
CED04	As-constructed drawings for works project and engineering inspection results	ArchSD	E00 or DGN	CED		All PDs
CED05	Ditto	DSD	E00 or DGN	CED		All PDs
CED07	Ditto	HyD	E00 or DGN	CED		All PDs
CED09	Ditto	TDD	E00 or DGN	CED		All PDs
CED10	Ditto	WSD	E00 or DGN	CED		All PDs
CED08	SMRIS data	LandsD	E00 or DGN	CED		All PDs
DSD07	Land Lot layout plans	LandsD	N / A	LandsD		DSD
DSD12	TPU / SB boundaries	PlanD	N / A	PlanD		DSD
HyD01	Slope boundary	ArchSD, CED, DSD, HyD, TDD and WSD	E00 or DGN	CED	E00, DGN & DBF	HyD

[11] File Format for textual data in the File Formats Standard would be determined and implemented along the implementation phase of the LandsD's future Data Dissemination System (DDS).

Existing Processes		CSU Data Exchange Process				
Process ID	**Data Exchanged**	**Data Owner**	**File Formats to Data Agent (From Data Owner)**	**Data Agent**	**File Formats to Data User (From Data Agent)**	**Data Uses**
HyD05	GIRS Data	LandsD	N / A	LandsD		HyD
LandsD01	Slope boundary	ArchSD, CED, DSD, HyD, TDD and WSD	E00 or DGN	CED		LandsD
RVD02	OPs, certificates and consents	BD	Follow the recommendations in IF[5]	LandsD		RVD
RVD06	TPU boundaries Plan	PlanD	N / A	PlanD		RVD

Table 18 Adoption of File Formats Standard to CSU Data Exchange Processes

8.6.9 All the above named CSU-data exchange processes should comply with the File Formats Standard except C&SD05, 08 and RVD02. Moreover, it is recommended that the principle to leverage the facilities now available in the layer naming standard defined in CSWP should be adopted in the context of CSU when exchange in DGN file format. Supporting views had already been sought from LandsD and some members of the CSWP Working Group. With consent from PDs to adopt the layer naming defined in CSWP in the exchange of CSU data, the project team would make the recommendation to CSWP Working Group who will follow up to review and provide practice notes in adopting CSWP layer naming in the exchange of CSU data. This subject could be carried over and reviewed in the Situation Analysis Review. For C&SD05, 08 and RVD02, the processes relate to the exchanges of "pure" textual information and IF applies.

Non-CSU data exchange processes among PDs

8.6.10 13 Processes belong to this catalogue (Appendix M.2). Among the 13 processes, RMA 2 (i.e. Maintain Current Practice) is recommended for the following 11 processes:

(a) 7 processes (ArchSD01, C&SD07, CED01, HyD15, PlanD08, PlanD10, RVD07) would require less than 2 man-days of Technical Efforts and 3 man-days of Professional Efforts annually. The efforts being used by the processes are considered as insignificant. It is recommended that these PDs could retain current practice (see RMA 2 in Section 6.1.3).

(b) There are 3 processes (HyD12, TDD01 and TDD03) reported with no problem in file format conversion. PDs make use of the base map provided by LandsD as backdrop (HyD12, TDD01) and supply GIRS data

to the TDD's consultant (TDD03). Since there is no problem and issues identified, PDs could retain their current practice.

(c) For HyD04, LandsD's base map is used as backdrop for design of works projects. HyD already has the facilities included in the systems for the symbol processing. About 24 man-days (from which 12 man-days is considered relevant to DAM 3. Please refer to the Cost Benchmark v0.2) would be required to re-symbolize the LandsD's base map in accordance with HyD's departmental standard. It is recommended that HyD could retain the current practice.

(d) Among these 13 processes, there are also data providers from non Works Departments (i.e. LandsD). A recommendation has been put forward to the CSWP Working Group to extend CSWP to cover the PDs (Non Works Departments). The Working Group opined that this would be the long-term plan of CSWP, and they would not take this up at this stage.

8.6.11 The 2 remaining processes DSD01 and WSD01 should be addressed by other means (RMA 3: Solve Data Exchange Problems by other means):-

(a) For DSD01, DSD would require an annual effort of more than 100 man-days to convert base map in 3D DGN to 2D DGN annually. Since LandsD currently provides digital base map in 3D DGN and most PDs would adopt 3D DGN according to CSWP, 3D DGN is suggested as the File Formats Standard. DSD is recommended to develop a software program to automate this routine file conversion process.

(b) For WSD01, about 4 man-days are used annually to upload the base map tiles in Arc/Info Coverage to the SDE. This process is not unique to WSD cause other PDs (e.g. HyD and RVD) also maintain their geospatial dataset in centralized RDBMS. These geospatial datasets are considered as feature-based (or seamless object-based) contrary to the tile-based base map provided by the LandsD. Consequently, the PDs need to "Merge" and "Clean" the map tiles and to construct the seamless database for their internal uses. The process(es) could not be streamlined by the File Formats Standard. On the other hand, in case that LandsD could provide seamless data sets, some post-processing efforts of PDs would be eliminated. It is recommended that LandsD should enhance the CLIS by migrating to seamless object-based database when resource is available so as to cater for other department's needs and minimize their data conversion effort.

Conversion Requirements and Implementation Option

8.6.12 It is recommended that File Formats Standard should be adopted for the following processes (See RMA 1):

(a) CSU data exchange processes – total 19 current processes would be affected.

(b) Non-CSU data exchange processes between PDs using new systems – no current process identified

(c) Non-CSU data exchange processes between PDs using existing systems and there are file format compatibility problems in these processes – no current process identified.

8.6.13 This section focuses on the conversion requirements and the options of implementing the File Formats Standard in the CSU data exchange processes.

Geospatial data and attribute data

8.6.14 In viewing that the recommended File Formats Standards are commonly used by most of the PDs, only CED and LandsD would require a new DCT. No extensive system revamp would be required by the PDs for standard file format compliance purpose. According to the inventory of PDs' GIS / CAD system (details in Appendix N.2), the follow table highlights the compliance of the PDs' current practices with the File Formats Standard.

	E00	DGN	DBF IV	Remark
Data Agent (Data Agent should comply with All the File Formats)				
LandsD	✔	✔	✔	LandsD might require a DCT or system revamps to provide data in E00 (Exported from Arc/Info Coverage Version 7).
PlanD	✔	✔	✔	PlanD could provide / receive data in E00, DGN and DBF as of current practices
CED	✘	✔	✔	CED might require a DCT to provide data in E00
Data Owner (Data Owner should provide data conforming to at least one recommended File Formats Standard)				
ArchSD				ArchSD could provide building information in DWG format. Separate consent already sought from LandsD.
BD				BD would provide textual information to LandsD. Please refer to section 6.2.4.
LR				LR would provide textual information to LandsD. Please refer to section 6.2.4.
RVD				RVD would provide textual information to LandsD. Please refer to section 6.2.4.
HyD	✔	✔		HyD would provide slope information to CED in DGN or E00.
TDD	✘	✔		DSD would provide slope information to CED in DGN only.
WSD	✔	✔		WSD would provide slope information to CED in DGN or E00.
DSD	✘	✔		DSD would provide slope information to CED in DGN only.

	E00	DGN	DBF IV	Remark
Data User (Data User should comply with at least one file format)				
ArchSD	✗	✔	✔	ArchSD might require a DCT to receive building data in DGN or E00. For slope data, the slope division could accept DGN.
BD	N/A	N/A	N/A	BD's GIS is under development
EMSD	N/A	N/A	N/A	EMSD is not the Data User of CSU data.
HyD	✔	✔	✔	HyD could accept either E00 or DGN as in current practices.
DSD	✗	✔	✔	DSD could accept DGN as in current practices.
TDD	✗	✔	✔	TDD could accept DGN as in current practices.
C&SD	✔	✗	✔	C&SD could accept E00 as in current practices
RVD	✔	✗	✔	RVD could accept E00 as in current practices
WSD	✔	✔	✔	WSD could accept E00 or DGN as in current practices

Table 19 Adoption of File Formats Standard by Data Agents, Data Owners and Data Users.

(a) Data Agents:-

(i) For PlanD, they already include the recommended File Formats Standard in the current practices. If any, the efforts required to implement the standard would be minimal.

(ii) Being the Data Agent of Slope CSU, CED should disseminate Slope CSU in both E00 and DGN. In viewing that CED does not have a suitable DCT to convert DGN to E00, CED might need to implement a new DCT.

(iii) For LandsD, data is currently provided in DGN and Arc/Info Coverage Version 6, LandsD might need a new DCT or revamp the existing system to comply with the standard (i.e. E00 exported from Arc/Info Coverage Version 7). This should be reviewed in the Supplementary Feasibility Study of the Data Dissemination System.

(b) Data Owners:-

(i) File format is not an issue for the Data Owner of TPU/SB and Road Centreline CSU since the Data Agent is the Data Owner.

(ii) All Data Owners (except ArchSD) are able to provide data conforming to at least one File Formats Standard. (Please refer to section 6.2.3 and for textual data, please refer to Section 6.2.4) For

ArchSD, separate agreement already sought from LandsD that ArchSD could submit building data in DWG format.

(c) Data Users:-

(i) All Data Users (except ArchSD in receipt of building information) could accept either E00 or DGN without major modification to the existing systems. For ArchSD, they are required to convert building data from DGN / E00 to AutoCAD-compatible format.

Other Data Formats

8.6.15 The File Formats Standard does not cover the file formats for other data. Exchanges of the other data (e.g. textual data) should comply with recommendations of IF. Under IF, XML v1.0 is the default documents / message formatting language. Hence, to comply with IF, textual data should be exchanged using XML.

8.6.16 In the context of CSU, according to IF, RVD, LR and BD might submit textual data to LandsD using XML. In viewing that LandsD is currently the only recipient of the textual data, the exchanges would be conducted in the LandsD's future Data Dissemination System (DDS) and the mechanisms to import and export the XML documents would be specified in the implementation phase of the DDS.

Programme of Adoption

8.6.17 Programme of implementing the Recommended Modes of Adoption (RMAs) is summarized as below:-

RMA 1: Adopt the File Formats Standard

8.6.18 RMA 1 is recommended to all CSU Data Exchange Processes. The implementation programme of RMA 1 should follow the schedule of implementing the CSUs, i.e. CSU Data Exchange Processes should comply with the File Formats Standard upon the rollouts of the CSUs.

RMA 2: Maintain current practice

8.6.19 RMA 2 is recommended to the processes discussed in section 6.1.10. PDs could continue to maintain their current practices. The compliance requirement to the File Formats Standard would apply when new systems are developed or existing systems are enhanced. The schedule of implementation would vary by department and the implementation schedule would not be discussed in DAM 3.

RMA 3: Tasks relating to issue which cannot be resolved by the standard

8.6.20 RMA 3 is recommended to the processes discussed in section 6.1.11. Those processes could have been improved by some other means, i.e. the problems inherited in those processes are due to causes that cannot be resolved by the File Formats Standard.

8.6.21 In WSD01, it is identified that some PDs developed feature-based, seamless geospatial datasets whilst tile-based geospatial data is currently provided by

LandsD. There are conversion efforts for the PDs to merge, clean and combine the map tiles. Subject to availability of resources, LandsD is recommended to enhance the CLIS by migrating from the current tile-based dataset to feature-based (object-based) data set as soon as possible.

8.6.22 Besides, in DSD01, DSD is recommended to develop an automatic program to convert 3D DGN to 2D DGN. The enhancement could be carried out at DSD's internal resources.

9 DAM 5 and DAM 6 – Metadata

9.1 Overview of DAM 5 and DAM 6 – Metadata

9.1.1 Among the 6 measures included in this DAM project, DAM 5 and DAM 6 are metadata related. Geospatial metadata is the data about geospatial data set. It describes the content, quality, condition and other characteristics of the data conforming to FGDC requirement or the latest standard promulgated by the respective Bureau.

9.1.2 The requirements for metadata management and submission of metadata to LandsD aligns with the following two technical circulars on administration of digital geographic data:

(a) Technical circular PELB TC 2/96 (also WBTC 19/96) sets the policy on the administration of digital geographic data for the various GIS in the Works Group and Planning, Environment and Lands Group of departments ("W-PEL departments");

(b) PELB TC 3/96 (also WBTC 20/96) defines the documentation requirements for Digital Geographic Data in the various GIS in the departments of Works Branch (of the Environment, Transport and Works Bureau) and those of the Planning and Lands Branch (of the Housing, Planning and Lands Bureau). This TC requires the W-PEL Department to deposit the metadata documentation and the Catalogue of GIS under their control, when available, at Land Information Centre (LIC) of Lands Department.

9.2 Metadata Catalogue System

9.2.1 While DAM 6 is intended to foster automation of production of metadata, i.e. to automate the production of data source metadata through the use of software tools, DAM 5 is for the implementation of a Metadata Catalogue System (MCS) where there are facilities which could allow the Participating Departments (PDs) to submit, search and retrieve geospatial metadata. The ultimate aim of the MCS is to improve the sharing of geospatial data among different departments and to improve the efficiency and effectiveness in metadata management, e.g. administration of the custodianship of metadata. Having knowledge about available spatial data sets, PDs can have better planning of using GIS technologies for their business need.

9.2.2 Currently, the Metadata Catalogue System (MCS) is hosted by LandsD. Enhancements to the metadata catalogue system (MCS) will soon be completed for catalogue services (DAM 5) purpose. The department based metadata and the CSU based metadata when available from the Data Agent of each respective CSU will be hosted in this MCS. Details on maintenance of metadata will be detailed in Volume 2H – Maintenance of Metadata.

9.3 Inventory of Metadata

Metadata Standard

9.3.1 The metadata documentation should conform to American Society for Testing and Materials (ASTM) Specification, "Standard Specification for Content of Digital Geospatial Metadata" and should migrate to International Organization for Standardisation (ISO) Standard on Metadata when it is formally launched and subsequently adopted by the Bureau.

9.3.2 Compliance to ASTM Specification for Content of Digital Geospatial Metadata will help enable[12]:-

(a) Maintenance of an organisation's internal investment in digital geographic data;

(b) Provision of information (except for information which is sensitive and confidential in nature) about an organisation's data holdings to data catalogues, clearinghouses, and brokerages, and

(c) Provision of information needed to process and interpret data to be received through a transfer from an external source.

9.3.3 The metadata standard will serve to provide a common set of terminology and definitions for concepts related to the metadata. It should be independent of software and hardware platforms and should cover the four roles played by the metadata as below:-

(a) *Availability*:- if the sets of data existing for a geographic location;

(b) *Fitness for use*:- if a set of data meets a specific need;

(c) *Access*:- how to acquire an identified set of data; and

(d) *Transfer*:- how to process and use a set of data

Department based metadata

9.3.4 A survey was conducted on metadata tools currently adopted amongst the 13 PDs. Table 20 illustrates the PDs, who are grouped into 3 categories:

(a) *Category A Non-GIS PD* – PD who does not possess any GIS software for the handling of geospatial data.

(b) *Category B Minor GIS PD* – PD who purchased standard GIS product mainly for viewing, spatial query and simple manipulation of geospatial data. The PD does not have a customised GIS application.

[12] ASTM Section D5714-95, "Standard Specification for Content of Digital Geospatial Metadata"

(c) *Category C GIS PD* – PD who owns customized GIS solution(s) for the creation, updating and maintenance of geospatial data to meet the business need of the PD.

PDs	**Category A** Non GIS PD	**Category B** Minor GIS PD	**Category C** GIS PD
ArchSD	✔		
BD	✔ [13]		
LR	✔		
TDD		✔	
EMSD		✔ [14]	
C&SD			✔ [15]
DSD			✔ [16]
RVD			✔ [17]
CED			✔
HyD			✔
LandsD			✔
PlanD			✔
WSD			✔

Table 20 Categorization of PDs

9.3.5 Metadata is not available from the Non GIS PDs nor from Minor GIS PDs. EMSD launched its pilot GIS and the manipulated data are mainly for trial and pilot purpose. For TDD, they procured a standard product for simple data manipulation. Though the products come with metadata production tools, they might not have a genuine need to maintain metadata for this purpose at this stage.

[13] BD will become Cat C on implementation of BDGIS scheduled in 2004.

[14] EMSD launched a pilot GIS application system and will become Cat C on its full implementation

[15] Yet to maintain metadata

[16] Yet to maintain metadata

[17] Yet to maintain metadata

PDs	System Name	Geospatial Data	Tools
EMSD	Pilot GIS	Footbridges and subways	ArcCatalog
TDD	Arc/Info	Base map	ArcCatalog

Table 21 Minor GIS PDs

9.3.6 While most PDs are maintaining their metatdata, RVD and C&SD are yet to maintain their own set due to resource constraint. DSD currently does not have their own set of metadata, but they will have plan to generate their metadata.

9.3.7 Table 22 summarises the metadata status of GIS PDs:

PDs	Metadata ID	System Name	Geospatial Data	Equipped with Metadata Tools	Method of Production	FGDC Compliant
C&SD	CSD-01	Digital Mapping System (DMS)	Buildings and Temporary Structures	Yes ArcCatalog	N/A	N/A
DSD	DSD-01	AM/FM	Drainage Network Data	Yes	N/A	N/A
RVD	RVD-01	Property Master System (PMS)	Property Data for tenement and valuation	Yes ArcCatalog	N/A	N/A
CED	CED-01	Slope Information System	Man-made slope Features	Yes ArcCatalog	Automated	Yes
	CED-02	Geological Modeling System	Geological data	Yes ArcCatalog	Automated	Yes
	CED-03	Computerised Slope Registration and Location Plan System	Man-made slope Features	N	Manual	Yes
HyD	HYD-01	Road Data Maintenance System (RDMS)	Road Related Data	Yes ArcCatalog	Automated	Yes
LandsD	LND-01	Computerised Land Information System (CLIS)	B1000, B5000, B10000, B20000 Base Maps & C1000 digital	Yes ArcCatalog	Automated	Yes

PDs	Metadata ID	System Name	Geospatial Data	Equipped with Metadata Tools	Method of Production	FGDC Compliant
			land record			
PlanD	PLN-01	Town Planning Information System (TPIS)[18]	1. Outline Zoning Plans 2. TPU 3. SB	Yes ArcCatalog	Automated	Yes
WSD	WSD-01	Digital Mapping System (DMS)	Water Mains Records Plan	Yes ArcCatalog	Automated	Yes

Table 22 Inventory of GIS PDs

9.3.8 CED chooses to do it manually for the Computerised Slope Registration and Location Plan System because the manual effort required is very minimum (see section 9.3.11).

9.3.9 The metadata in the GIS systems of LandsD are updated to this year whereas those of CED and WSD were dated 1998 and 2001 respectively.

9.3.10 HyD and PlanD reported that the metadata are updated on a need basis, normally once per year, whereas LandsD is maintaining the update their metadata at regular interval.

9.3.11 The manual efforts involved in the generation of metadata during maintenance range from 1 hour (e.g. CED) to up to 2-3 man days (e.g. PlanD and LandsD) for each update. The effort varies by the amount of information and the manual checking that would be involved.

CSU based metadata

9.3.12 In the context of DAM, the generation of the metadata would be carried out by the Data Agents of respective CSUs who have to implement a CSU data dissemination system. The data dissemination system would be provided with an automated tool for metadata production purpose. The Data Agents of respective CSUs have to maintain the metadata documents of the Common Spatial Units. The generated product "metadata" would be submitted and hosted in the Metadata Catalogue System.

[18] According to LandsD, the metadata documentation of TPUS is deposited in LandsD, but PlanD requests that the documentation cannot be placed in LandsD's Metadata Catalogue System for searching.

9.4 Inventory of Department Based Metadata Tools

Department based metadata

9.4.1 The tools adopted by PDs are mostly ArcCatalog running under Windows NT 4.0, Windows 2000 and different Unix environment, and a variety of GIS software versions.

9.4.2 An inventory of the metadata tools adopted by the GIS PDs is summarised in Table 23. It shows the PD's systems, environment, software and geospatial datasets, including information of the last updated date, updating frequency, and manual processing effort involved in each production of metadata for their datasets.

CSU based metadata

9.4.3 For TPU / SB CSU, the same metadata production tool of the system Town Planning Information System (TPIS) will be used to generate the metadata of TPU / SB CSU.

9.4.4 For Slope CSU, the same metadata production tools of the system Slope Information System (SIS) will be used to generate the metadata of Slope CSU.

9.4.5 For tools of Building CSU, Lot CSU and Road Centerline CSU, they will be included in the CSU DDS. The requirement is already included in the Supplementary Feasibility Study of the LandsD Data Dissemination System.

Department	System Name	Operating System	GIS Software	Spatial Data Format	Textual Data Format	Description of metadata	Metadata Tool	Manual Effort[19] - First Preparation	Last Update Date	Freq[20]	Manual Effort[21]- Maintenance
CED	Slope Information System	WinNT 4.0	Microstation J	DGN	Oracle	Metadata documentation is available.	ArcCatalog[22]	PTO(G): 3	1998	A-Y	PTO(G): 2
	Geological Modeling System	WinNT 4.0	ArcGIS 8.X	DGN	dbf	Metadata documentation is available.	ArcCatalog	-	-	N / A	STO / TO:1
	Computerised Slope Registration and Location Plan System	WinNT 4.0	Microstation J + Geographics	DGN	Oracle	The CSRLP system maintains a digital map database as an up-to-date registrar of all registered slope features in the Hong Kong Territories (copy of metadata attached).	-	-	Jun 2003	A-Y	1 hour
HyD	Road Data Maintenance System (RDMS)	Window 2000 (SP2)	ArcInfo / ArcSDE v8.1.2	ArcSDE	Oracle	See http: / / www.info.gov.hk / landsd / mapping / eng / lic / metadata.htm	ArcCatalog	SO: 4	Feb 2003	A-Y	SO:2

[19] Manpower resources required in the first preparation of metadata generation are shown in terms of number of man-days & rank.

[20] Updating Frequency is expressed in terms of Occurrence and Duration, i.e., How often the metadata is generated within a specified duration, where, Occurrence: "O" = On an on-going basis, "A" = On an ad-hoc basis; Duration: "Y" = Year, "H" = Half Year, "Q" = Quarter.

[21] Manpower resources required in subsequent maintenance for each metadata update are shown in terms of number of man-days & rank.

[22] CED has access to an Arc / Info software, and would make use of the available ArcCatalog tool for future generation and maintenance.

Department	System Name	Operating System	GIS Software	Spatial Data Format	Textual Data Format	Description of metadata	Metadata Tool	Manual Effort[19] - First Preparation	Last Update Date	Freq[20]	Manual Effort[21]- Maintenance
LandsD	Computerized Land Information System (CLIS)	Solaris v2.6	Arc/Info v6.x	Arc/Info Coverage	Info	Metadata documentation for B1000, B5000 digital topographic maps (Basic Mapping System) are available.	ArcCatalog	LS:1 PTO/STO: 1.75 TO: 3.5	Jun 2003	O-Q[23]	LS:0.3 PTO/STO: 0.8 TO: 1.5
		Solaris v2.6	Arc/Info v6.x	Arc/Info Coverage	Info	Metadata documentation for C1000 digital land record (Cadastral Information System) is available Jan 2004.	ArcCatalog	LS:1 PTO/STO: 1.75 TO: 3.5	Jan 2004	O-Q	LS:0.3 PTO/STO: 0.8 TO: 1.5
		Windows NT	Microstation	DGN/ Arc/Info	Access	Metadata documentation for B10000, B20000 (Small Scale Mapping System) is available.	ArcCatalog	LS:1 PTO/STO: 1.75 TO: 3.5	Jun 2003	O-H	LS:0.3 PTO/STO: 0.8 TO: 1.5
PlanD	Town Planning Information System (TPIS)	Solaris v2.6	Arc/Info v 7.2.1	Arc/Info Coverage	Info	TPU and SB metadata provided.	ArcCatalog	TO:2 STO:1	May 2003	A-Y	TO:2 STO:1
WSD	Digital Mapping System (DMS)	SGI IRIX 6.5	Arc/Info 8.0 SDE 3.2		Oracle and Info	Metadata documentation is available:-	ArcCatalog	-	Feb 2001	-	-

Table 23 An Overview of Metadata Generated within GIS PDs

[23] The update frequency of metadata for B1000, B5000 digital topographic maps and C1000 digital land record would be at half-yearly interval initially, and later at quarterly interval.

10 DAM 4 - Policy

10.1 Complementary Policy

10.1.1 Recommendations from DAM might contribute to the Interoperability Framework (IF), which defines a collection of technical and data specifications aimed at facilitating the interoperability of Government systems and services for enabling the sharing of data and information between these systems. These recommendations include the CSU definition and logical data model for systems interface, departmental symbol specification and file formats standard for exchange of PLW data. Exchange of PLW data, conforming to the DAM specification, between computer systems running on different hardware and software platforms by different B/Ds can be made interoperable.

10.1.2 Implementation of the above would require complementary policy provisions which need to be promulgated through an institutional framework. The complementary policy provisions include:

(a) A high level policy that drives the implementation of DAM and aligns with the HKSAR government's e-Government Policy.

(b) A management framework overseeing the above and the implementation of:

(i) Specification and custodianship of DAM 1;

(ii) Departmental symbol specification and inventory of GIS maps of DAM 2;

(iii) File Formats Standard of DAM 3;

(iv) Metadata Catalogue Service of DAM 5; and

(v) Migration from DAM to DAF.

Objectives

10.1.3 In the context of DAM 4, the objectives of the complementary policy are to set the direction on how B/Ds should work together and to accomplish the following objectives:

(a) Improve efficiency and effectiveness on exchange of PLW data and avoid the repeated recurrence of similar problems;

(b) Synergise the investment already invested by PDs on GIS systems and improve sharing of experience and knowledge in GIS technology;

(c) Align with similar initiatives of other B/D;

(d) Provide continuity and a smooth transition from DAM to DAF; and

(e) Institutionalize the releases of the latest update of the requirements with respect to the accountability for care and maintenance, custodianship

principle, mechanism (including processes and procedures) for maintenance of CSUs, symbology, file format and metadata.

10.1.4 Despite the fact that DAMs are temporary measures which are to be implemented to improve the efficiency and effectiveness on exchange of PLW data, they actually form an interim milestone, which demonstrates the determination and capability of joint effort from B/Ds towards an e-Government policy. On successful implementation of the DAM and when resources permit, there is an opportunity that DAM would be migrated to the DAF as was recommended in the Data Alignment Strategy.

10.1.5 There are identified areas good for business process re-engineering which can be carried out outside the scope of DAM[24]. Business process re-engineering involves the re-thinking and redesign of business processes to achieve improvements in performance with respect to quality, service, cost, and lead-time. There are some processes which should have been streamlined in the mechanism and procedures for subsequent maintenance of the CSU, but these processes are constrained by the current departmental procedures and business rules. It is recommended that PDs should continue to take it up outside the scope of DAM. This is vital if HPLB are to reap the real benefits of the whole DAM initiative while PDs could benefit from the efficiency productivity improvement.

10.1.6 On successful implementation of DAM, it is likely that the DAM initiative will be extended to include other government departments and non-government agencies in the exchange of PLW data or even in the Electronic Services Delivery in the delivery of planning, lands and works projects.

10.1.7 We have reviewed the current e-Government environment and recommended that new complementary policy provisions should be provided in the context of DAM.

Alignment with e-Government policy

10.1.8 To conform to the HKSAR e-Government policy and to accomplish the objectives outlined in sections 10.1.3, 2001 Digital 21 Strategy sets the direction for B/Ds footprint to follow. B/Ds should collaborate to work together and lead by example in the context of exchange of PLW data. A high level policy that drives the implementation of DAM and aligns with Digital 21 Strategy should be implemented to cover the following two areas:

(a) Roadmap of DAM and its migration to DAF

[24] Several possible areas good for business process reengineering have been identified, including:·
- Release of building layout plan by BD prior to the issue of Occupation Permit. Instead of approaching the property developer individually by each PD, BD could act as a custodian and re-distribute the softcopy building plans to the related parties before the OP is issued. Duplicated efforts within PDs to digitise building plans (from hardcopy) and delay incurred from data requisition could be reduced.·
- Unify the development of departmental GIS portal. Instead of having each department develop its own GIS portal, initiatives can be taken to consolidate the departments' need and to form a one-stop solution for all.

(i) The policy should set the long term partnering arrangement among PDs who are committed to ensure that they lead by example to improve efficiency and effectiveness on exchange of PLW data

(ii) Alignment with other similar initiatives of other B/D

(iii) The policy should provide continuity and a smooth transition from DAM to DAF

(b) Efficiency Productivity Programme

(i) PDs should be encouraged to identify areas good for business process reengineering in the context of DAM.

(ii) PDs should be encouraged to synergise the investment already invested or to be invested on GIS systems and improve sharing of experience and knowledge in GIS technology.

Management framework for DAM

10.1.9 A complementary policy should be provided to mandate a provisional organization structure overseeing the implementation of DAM and to take up the role overseeing how DAM is made to align with the e-Government Policy. The organization structure will institutionalize the release of the latest update of the requirements with respect to the accountability for care and maintenance, custodianship principle, mechanism (including processes and procedures) for maintenance of CSUs, symbology, file format and metadata. Details include:

(a) Set a timeframe when DAM shall take effect

(b) Promote the take up of DAM by other government departments and non government agencies

(c) Maintain specification of DAM 1, DAM 2, DAM 3 and metadata of the selected CSUs

(d) Define roles and responsibilities of Data Agents, Data Owners with respect to the custodianship of the selected CSUs

(e) Administer CSUs with respect to its currency and timeliness

(f) Administer the Metadata Catalogue System

(g) Oversee take up rate and feedback on submission and dissemination of CSU data and mechanism for maintenance of specification of DAM 1, DAM 2, DAM 3 and metadata of selected CSU

(h) Oversee take up rate and feedback on submission and retrieval of metadata

(i) Advise terms on use of CSU data, including measures for privacy protection and standard license conditions for providing data to non-government organizations

(j) Manage resource arrangement to facilitate the implementation while at the same time, resources could be better coordinated in GIS development and duplication of effort could be avoided

(k) Facilitate process to handle change request, e.g. reengineering of inter-department processes

10.1.10 While funding has been a key concern to most PDs, there are policy provisions currently provided to address funding issue. Non-recurrent costs for computer systems with a value not exceeding HK$10M could be funded under the block vote controlled by the Administrative Computer Projects Committee (ACPC). Major systems exceeding HK$10M shall be approved by Finance Committee (FC). However, under the current financial arrangement, recurrent cost for such projects would have to be absorbed or shared by departments. PDs should be able to absorb the costs for minor works. For major data conversions and system revamping, departments could apply for funds through the normal resource allocation channels. There could be other innovative means to establish a mechanism of cost sharing among B/Ds, but this would be taken up as an overall B/D policy and would not be handled within DAM.

Promulgation

10.1.11 Implementation of DAM would require an institutional framework to promulgate the complementary policy provisions and other institutionalised requirements for the implementation, ongoing administration and maintenance activities of DAM. It should be extensible to facilitate future activities to be held in line with the Data Alignment Strategy and e-Government initiatives.

10.1.12 The policy and administrative arrangement should be agreed between PDs, HPLB and ETWB such that the measures could be better enforced with the least administration overhead.

10.1.13 We have reviewed the recommendations made in DAM 1, 2, 3 and the implementation details in DAM 5. Also we have reviewed the current provisions made in the HPLB/ETWB Technical Circulars. A majority of the DAM (1, 2, 3 and 5) processes and measures are not covered in the existing policies promulgated through ETWB/HPLB Technical Circulars nor the Project Administration Handbook of Works Departments of ETWB. Also there are PDs which are outside the jurisdiction boundary of HPLB nor ETWB, we recommend that policy gap should be filled by:

(a) Promulgating revisions or new technical circulars of HPLB, ETWB and CITB.

(b) When required, separate arrangement between B/Ds through standing instructions by memorandum.

(c) Specification and other requirements for the implementation of DAM could be institutionalized through release of practice note. When considered appropriate, the mandated organization structure should be

delegated with the authority to prepare, maintain and release the practice note(s) that could be for share use by all 13 PDs.

10.1.14 Details would be discussed in Volume 3A of the Final Report.

10.2 Alignment with e-Government Policy

Long-term Partnering Arrangement Among PDs

10.2.1 Partnering is a new approach currently adopted by a few B/Ds in the business with their business partners. For example, HyD is partnering with their consultants and contractors in some selected works projects. This partnering works on the principle that every stakeholder signs on a common agreement and they work towards the common agenda. It is believed that this partnering approach is cost effective and will incur the least administration overhead in the overall works projects delivery process. One shortcoming in this scenario is that the partnering is project centric and there is lack of continuity from projects to projects.

10.2.2 While inter B/Ds collaboration has been a routine in the B/Ds business environment, the partnering culture is not so common due to institution barriers, e.g. department interest versus the government as a whole. It is observed that that there are project overlaps, duplicated investment on IT infrastructure and duplicated effort in the business processes, the set up of the DAM project provides a good environment good for project-centric partnering. In view of the possible migration from DAM to DAF, it could also set a scene good for long term partnering. A role model should be recognised and the concept of sharing resources should be promoted. This could help accomplish a higher return from the investment for the government as a whole, i.e. a higher percentage of the investment could be spent on the infrastructure "technology" while the sharing could result saving from minimising overlapping B/D initiatives and project administration overhead. In the process of improved collaboration, the cost and saving arising from the change might not always come from the same PD. Very often, the PD who volunteers to contribute more would have to incur additional cost while the contribution would benefit other PDs in the downstream processing. B/Ds should work on trust as they need to prove to each other that no B/D is taking advantage of the other B/D by only "take" but not "give". In the context of DAM, it is recommended that the PDs should agree on:

(a) Lead by example to demonstrate B/Ds team building

(b) Determined to resolve inter-department and intra-department data alignment issues

(c) Not to reinvent the wheel, but to leverage on what is already from other B/Ds, e.g. GIS information hub for data dissemination, query and analysis.

(d) Share know-how in GIS technology

(e) Attend requests from other B/Ds and will commit affordable resources to facilitate downstream process

(f) Commit to deal with other external interfaces to make the change happen

Alignment with Similar Initiatives of Other B/Ds

10.2.3 DAM includes measures good for exchange of CSU and non CSU data. There are other provisions in CSWP and IF which are useful for exchange of non CSU data.

10.2.4 The subsequence maintenance of DAM, CSWP and IF should be well coordinated such that the overall infrastructure is complementary and the set standards align with each other where applicable and practical.

10.2.5 Apart from the initiatives on the infrastructure, the GIS initiatives of B/Ds should be aligned with each other such that GIS technology could be deployed to its best capabilities and overlapping initiatives should be avoided. It is a key success factor that the vision needs to be shared and an overall GIS strategy must be aligned with B/Ds. This strategy should be a top down policy since bottom up would take a long cycle time for alignment of agenda of B/Ds. LandsD would be a key stakeholder in the evolution process and is a good candidate department to drive the DAF if DAM is proved successful in the SAR

Continuity and a smooth transition from DAM to DAF

10.2.6 DAM provides interim measures to improve efficiency and effectiveness in the exchange of PLW data. The policy should set a common vision that could be shared by all PDs and the DAM would migrate to DAF in terms of:

(a) Increased number of participating departments

(b) More CSUs defined to meet the common business needs of the PDs

(c) More standards developed or when applicable, leverage on the standards already built in other initiatives, e.g. CSWP and IF contribute to the common data standard at HKSAR government level

(d) A better integrated infrastructure which could be shared for data storage and dissemination of metadata and business aligned PLW data (available in standard file format standards), query and analysis

Business process reengineering in the context of DAM

10.2.7 There are identified areas good for cross-departments business process re-engineering which can be taken up in joint collaboration among PDs. More improvement areas could be identified and such initiatives should be encouraged and possibly with assistance from Efficient Unit who could provide expertise and advice on how reengineering could be accomplished. This is vital if HPLB are to reap the real benefits of the whole DAM initiative while PDs could benefit from the efficiency productivity improvement.

Synergise Investment

10.2.8 PDs have been asking and investing resources individually on implementation of GIS. These GIS initiatives of the PDs could have been better coordinated from business perspective. Well-coordinated investment among PDs could help

synergise the investment already invested by PDs on GIS systems and improve sharing of experience and knowledge in GIS technology. Overlapping initiatives could be minimized. In this regard, it is recommended that HPLB and ETWB should lead by example and improve the sharing of information to ensure that all GIS initiatives of HPLB and ETWB departments are well coordinated from policy support perspective, e.g. coordination of GIS initiatives contained in the Departmental IT Plan (DITP) of respective departments. CITB, who is a participating bureau of the DAM project, is also the policy bureau approving funding application of IT computer systems of government departments with a value not exceeding $10m under the block vote controlled by the Administrative Computer Projects Committee (ACPC). For better coordination of GIS initiates from the government as a whole, it is recommended that CITB should seek view from the DAM Management Committee who could advise how the facilities available from DAM would bring value to the GIS initiatives of government departments. If such procedure could be formalized, this could help CITB coordinate feedback to departments and encourage departments to leverage the GIS investment already made by other departments. Departments could focus on their core business and avoid spending resources on the overlapping initiatives.

10.2.9 In this regard, the mandated organization structure (to be discussed in section 10.3) would have an important role to advise Bureaux (HPLB/ETWB/CITB) and other policy Bureaux if the initiatives proposal from PDs would receive policy support from DAM perspective.

10.2.10 The mandated organization structure could also take a role to improve sharing of experience and knowledge in GIS Technology and to advise B/Ds how the evolving GIS technology could benefit PDs and also on the maintenance of DAM 2 and DAM 3 (e.g. when GML comes to a mature stage).

10.3 Management Framework for DAM

10.3.1 The complementary policy should also include a management framework which could promote the collaboration among PDs, monitor feedbacks and resolve problems encountered in the implementation of DAM.

10.3.2 The management framework should mandate an organization structure which shall be delegated with the authority to oversees the implementation of the above and to institutionalize the release of the requirements with respect to the accountability for care and maintenance and custodianship principle which would be discussed in Volume 2I. Together with these details, other recommendation in the context of DAM 1, 2, 3 and 5 would be promulgated through practice notes to be prepared, maintained and released by the organization structure.

10.3.3 Details of the management framework would be discussed in Volume 3A of this Final Report.

Provisional Organisation Structure

10.3.4 A Provisional DAS Organisation Structure shall be mandated to overseeing the implementation of DAM, the Situation Analysis Review and later implementation of DAF.

10.3.5 A two-tiers organization structure, similar to the current two-tiers structure overseeing the DAM project, is recommended. The mandate of the Provisional DAS Organisation Structure is not project oriented, but it is a structure affiliated with participating B/Ds who, sharing the vision and aligning with the policy, work together to accomplish the following objectives:

(a) Implement the road map and the efficiency productivity programme;

(b) Institutionalize requirements and specification for the implementation of DAM

10.3.6 The structure comprises:

(a) DAS Task Force

(b) DAM Management Committee

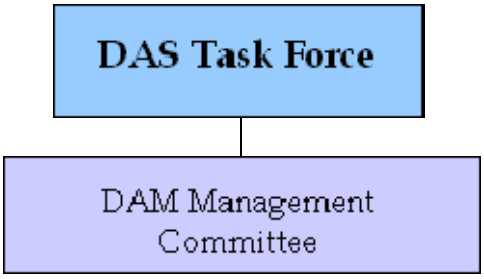


Figure 29 Provisional DAS Organisation Structure

10.3.7 Despite the fact that DAM was initiated by HPLB, there is an opportunity that DAM would be extended to include other non PDs in the future. The steering role could be better coordinated at joint Bureau level.

10.3.8 In addition to the regular memberships, it is recommended to appoint two "co-opt" advisors to sit in the DAS Task Force and the DAM Management Committee:

(a) GIS Advisor/Coordinator -

(i) He/she will offer professional advice on issues related to geospatial data exchange and sharing and is essential to support the proper functioning of the proposed structure. He/she could offer an independent view on how the GIS initiatives of the PDs could be synergised, but without compromising the level of service of each PD. Currently, PDs have been asking for precious government resources for implementation of departmental GIS separately. These GIS initiatives of the PDs, usually require significant resources in terms of money and staff input, could have been better coordinated from business perspective if a central advisor or coordinator with the necessary insight and

expertise could be appointed in the Government's administrative level. Well-coordinated investment among PDs could help synergise the investment already invested by PDs on GIS systems and improve sharing of information. This GIS Advisor/Coordinator's expertise and involvement is indispensable to help identifying collaboration opportunity, to provide insight, necessary elaboration and suggestion on proper direction to the DAS Task Force. Subject to the final arrangement on the terms of appointment of the GIS Advisor, he/she would play a crucial role to advise B/Ds how the facilities available from DAM would bring value to the GIS initiatives of government departments and offer views to assist policy bureaux in making the decision for policy support to these GIS initiatives. He/she could be a facilitator to help bridge the gap and encourage departments to leverage the GIS investment already made by other departments. Departments could then focus on their core business and avoid spending resources on the overlapping initiatives.

(ii) The GIS Advisor/Coordinator shall be a qualified personnel who is perceived to be neutral from GIS vendors' products and is an expert in GIS technology with practical experience in GIS implementation and project management. He/she should preferably come from Bureau or be seconded to Bureau from PDs. Highly regarded and renowned GIS professional personnel from the industry who are not affiliated with any particular GIS software vendors or products can also be considered to taking up this role. Given the need of independence and objectivity, the former arrangement is more suitable. A GIS expert at the bureau level with practical implementation experience will play an important role and is an essential element to the long term success and formulating visionary yet pragmatic policies. He/she should preferably come from Bureau or be seconded to Bureau from PDs. HPLB GIS Advisor should be a regular member of the Task Force and DAM Management Committee. If no suitable candidate is available from B/Ds, HPLB could consider to source the equivalent candidate from the industry. In this regard, co-opt term membership could be considered.

(iii) The GIS Advisor shall provide help, insight, necessary elaboration and suggestion on proper direction to the DAS Task Force. GIS expertise is indispensable to help identifying collaboration opportunity.

(iv) The GIS Advisor shall provide the overall GIS direction in the government and facilitate the proper functioning of the DAS Task Force and DAM Management Committee.

(v) The GIS Advisor shall help address important issues and steer towards appropriate direction with long term impact to the whole government This is a key to success of future implementation and the continued improvement within the government on geospatial information sharing and exchange.

(b) BPR Advisor - There are identified areas good for cross-departments business process re-engineering which can be taken up in joint collaboration among PDs. More improvement areas could be identified and such initiatives should be encouraged. Colleagues having relevant from experience from EU are good candidates to taking up this role. He/she could provide expertise and advice on how reengineering could be accomplished. Also he/she will advise on how the cross-departments BPR initiatives should be prioritized and assist to offer expertise advise on how the institutional barriers should be addressed to improve efficiency and effectiveness.

10.3.9 The structure and its membership will be documented in the draft Technical Circular in Volume 3A.

DAS Task Force

10.3.10 The main tasks of members of the DAS task Force are summarized below by the roles they play in the DAS Task Force:

(a) Executive (Chairman) - The main tasks are to:

(i) Represent the overall interests of the business;

(ii) Organize and chair the DAS Task Force meetings;

(iii) Lead and resolve differences among PDs in the implementation of policy and DAM;

(iv) Ensure individuals are appointed to respective roles in the Organization structure, including the co-opt membership of GIS Advisor and BPR Advisor;

(v) When supported with justifications, recommends new complementary project items that are required for the implementation and maintenance of DAM and onward migration to DAF. The project items could be taken up by in-house staff or outsourced to a professional service provider;

(vi) Signify acceptance of deliverables upon the completion of the milestone of the respective complementary project items; and

(vii) Monitor Situation Analysis Review.

(b) Senior User - The main tasks are to:-

(i) Represent the interests of the PDs;

(ii) Consider and agree activities and products which will directly affect the users;

(iii) Align user resources;

(iv) Resolve conflicts concerning users' requirements and / or their priorities; and

(v) Ensure that the respective members of the DAM Management Committee are properly briefed to deal with day-to-day matters.

(c) Senior Technical - The main tasks are to:-

(i) Consider the technical implications of the recommendation from the deliverables of DAM;

(ii) Consider and agree product descriptions and specifications of technical products;

(iii) Assign technical resources needed by the DAS;

(iv) Resolve conflicts concerning technical requirements and their priorities; and

(v) Ensure that the Technical Assurance Coordinator of the DAM Management Committee is properly briefed to deal with day-to-day matters.

(d) GIS Advisor – The need for the GIS Advisor is explained in section 10.3.8(a). The main tasks are to answer Task Force enquires on the recommendations made by the DAM management Committee on:

(i) how to improve the coordination of implementation of department GIS projects among the PDs and to advise on how the technology should be managed from the overall B / Ds' perspective for migration from DAM to DAF;

(ii) how to synergise the investment already invested or to be invested by PDs on GIS systems and update Task Force members on the appropriate GIS technology for PDs' application;

(iii) providing help, insight, necessary elaboration and suggestion on proper direction to the DAS Task Force. GIS expertise is indispensable to help identifying collaboration opportunity;

(iv) providing the overall GIS direction in the government and facilitate the proper functioning of the DAS Task Force and DAM Management Committee; and

(v) addressing important issues and steering towards appropriate direction with long term impact to the whole government This is a key to success of future implementation and the continued improvement within the government on geospatial information sharing and exchange.

(e) Business Process Reengineering Advisor – The main task is to:

(i) Advise Task Force members on how the cross departments BPR initiatives put forward by the PDs should be prioritized and implemented; and

(ii) Align resources to offer advice and go through the process review with respective PDs

DAM Management Committee

10.3.11 The main tasks of members of DAM Management Committee are summarized below by the roles they play in the Committee:

(a) Executive (Chairman) - The main tasks are to:

(i) Lead and resolve differences among PDs in the implementation of policy, coordination of joint B/Ds initiatives, and implementation of DAM;

(ii) Report to the DAS Task Force on the present status, work plan and issues arising from the execution of the road map, efficiency productivity programme and implementation of the CSUs and department symbology specification and implementation of file formats standards;

(iii) Overall administration of the implementation of the specification of CSU and symbology and implementation of file formats standards;

(iv) Chair DAM Management Committee meetings including Checkpoint Meetings; and

(v) Promote DAS to include other non PDs in the overall implementation.

(b) User Assurance Coordinator (UAC) - The main tasks are to:-

(i) Represent the Senior Users (of the DAS Task Force) in taking care of user interests and activities;

(ii) Monitor and report to the Senior User any user related problems that arise on implementation of DAM;

(iii) Ensure that the users' requirements are properly addressed throughout the implementation of DAM;

(iv) Manage complementary project items as per directive from DAS Task Force;

(v) Attend DAM Management Committee Meetings including Checkpoint Meetings, when required; and

(vi) Monitor all exceptions and assist in the impact analysis on user related areas.

(c) Technical Assurance Coordinator (TAC) - Technical Assurance Coordinator will be the contact point for IT logistic support, coordinate the internal technical teams for comments on the technical deliverables from any complementary project items approved by the DAS Task Force . The main tasks of the Technical Assurance Coordinator are to:-

(i) Select the appropriate technical strategy and methods;

(ii) Advise the application of technical standards;

(iii) Advise the quality criteria and attendees for reviews of technical products;

(iv) Monitor the progress of technical issues against the plan and remedy the situation in case of any major deviations; and

(v) Attend DAM Management Committee Meetings including Checkpoint Meetings.

(d) GIS Advisor

(i) Advise DAM Management Committee on how to improve the coordination of implementation of department GIS projects among the PDs and to advise on the appropriate technology for migration from DAM to DAF;

(ii) Advise DAM Management Committee on how to synergise the investment already invested or to be invested by PDs on GIS systems and improve sharing of resources, experience and knowledge in GIS technology;

(iii) Provide help, insight, necessary elaboration and suggestion on proper direction to the DAS Task Force. GIS expertise is indispensable to help identifying collaboration opportunity;

(iv) Provide the overall GIS direction in the government and facilitate the proper functioning of the DAS Task Force and DAM Management Committee; and

(v) Address important issues and steering towards appropriate direction with long term impact to the whole government This is a key to success of future implementation and the continued improvement within the government on geospatial information sharing and exchange.

(e) Business Process Reengineering Advisor - Advise DAM Management Committee on how the cross departments BPR initiatives put forward by the PDs should be prioritized and implemented.

10.3.12 There could be ad hoc working groups or sub working groups under the DAM Management Committee. With the example of CSU sub working group, Figure 30 below, illustrates the general organizational structure:

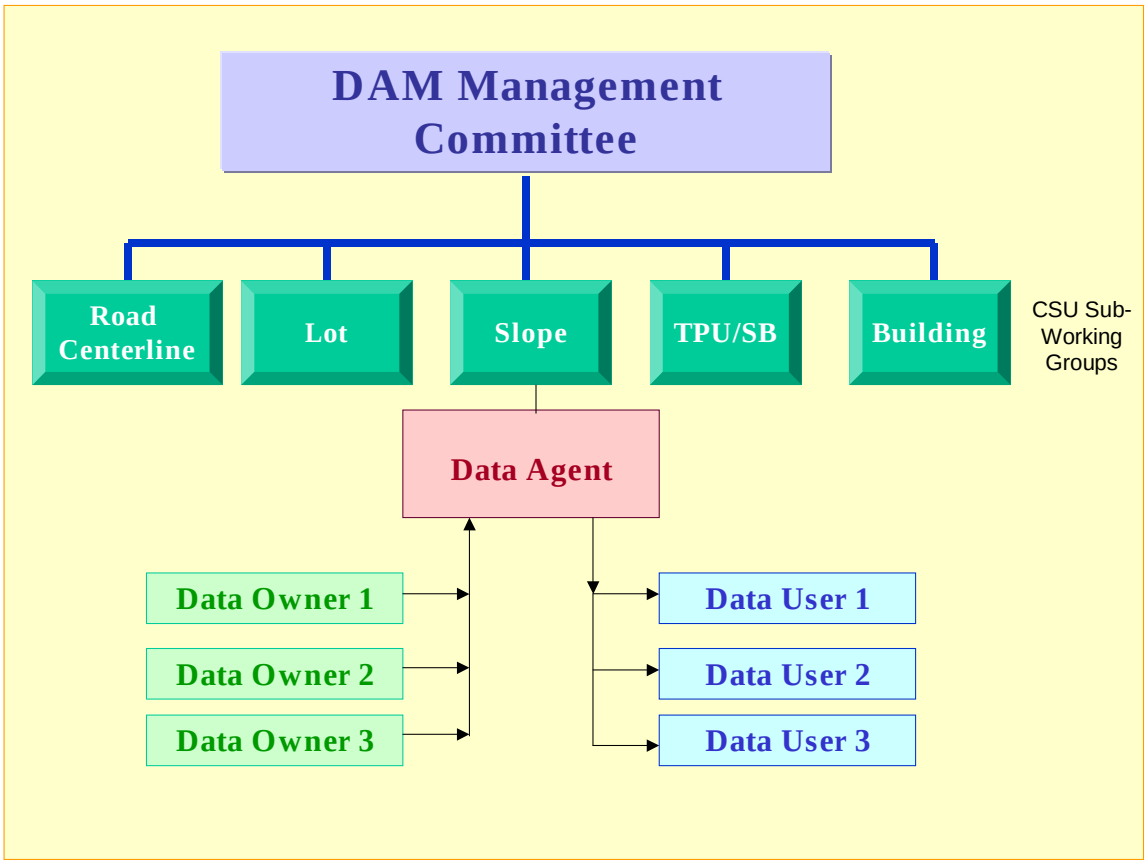


Figure 30 DAM Management Committee structure (using Slope CSU as an example for illustration)

10.3.13 To facilitate the joint B/Ds coordination and implementation of the CSUs, it is recommended for the future sub-working groups to retain composition of the existing CSU sub-working groups. In situation where ad-hoc sub-working group(s) are required, each group should be represented by the responsible personnel nominated by the PDs or agreed by the DAM Management Committee, who is seen to be impartial to all PDs in the sub-working Group.

10.3.14 The mandate of CSU sub-working group is to make recommendation on issues relating to the maintenance of CSUs for the DAM Management Committee approval. The PDs' participation on each sub-working group is proposed below:

	Slope	Building	Road Centreline	Lot	TPU/SB
BD	✔	✔		✔	
C&SD		✔			✔

	Slope	Building	Road Centreline	Lot	TPU/SB
LandsD	✔	✔	✔	✔	✔
LR[25]	NA	NA	NA	✔	NA
PlanD		✔		✔	✔
RVD		✔		✔	
ArchSD	✔	✔			
CED	✔		✔	✔	
DSD	✔			✔	
EMSD			Recommended		
HyD	✔		✔		
TDD					✔
WSD	✔				

Table 24 Sub-working group compositions

10.3.15 Although EMSD is not currently in the sub-working groups of the selected CSUs, it is recommended that they should participate in the appropriate sub-working groups on implementation of DAM 1 since the content of the CSU would be of interest to them.

10.3.16 Other issues on symbology specification, file formats standard, metadata and relevant policy issues relevant to a particular CSU could also be resolved in each CSU sub-working group.

10.3.17 Membership of ad-hoc sub-working groups could vary by their terms of reference and mandate to be agreed by the DAM Management Committee.

10.3.18 To cover different technology areas and to facilitate coordination of B/Ds GIS projects, it was recommended to form ad-hoc sub-working groups or sub-working groups, e.g. GIS department projects coordination sub-working group. Each of these sub-working groups would be represented by the responsible personnel nominated by the PDs or agreed by the DAM Management Committee.

10.3.19 The responsibilities of the GIS department projects coordination sub-working group are to:-

(a) Advise /coordinate GIS implementations of the PDs;

(b) Advise PDs on the appropriate technology for the implementation of new GIS and revamping of their existing GIS system;

[25] LR confirmed that the CSU would have no direct use to their business, but they would like to be kept informed about the progress of DAMs

(c) Leverage the existing investment already put on GIS by various PDs for shared use by other B/Ds. Encourage PDs to make use of the resources now available with DAM;

(d) Advise the way forward to DAF;

(e) Act on behalf of the DAS and interface with similar initiatives of other B/Ds, e.g. IF;

(f) Organize GIS technology seminars.

10.4 Promulgation of Measures

Practice notes for DAM implementation

10.4.1 While the implementation of DAS will be promulgated with a Technical Circular (please see draft Technical Circular in Volume 3A), technical details and administration details could be promulgated by practice notes.

10.4.2 It is recommended that the Provisional DAS Organisation Structure shall be mandated to institutionalize the specifications and requirements for the implementation of DAM with the issue of practice notes.

10.4.3 The practice notes shall cover:

(a) Specification and explanatory notes of Building CSU

(b) Specification and explanatory notes of Lot CSU

(c) Specification and explanatory notes of Slope CSU

(d) Specification and explanatory notes of Road Centerline CSU

(e) Specification and explanatory notes of TPU/SB CSU

(f) Inventory of GIS Maps

(g) Maintenance of File Format Standard

(h) Maintenance of Metadata

(i) Data Custodianship and License Agreement

10.4.4 The above practice notes covers the specifications and explanatory notes of 5 CSUs developed in DAM 1, the departmental symbol specification recommended in DAM 2, file formats standards and its program of adoption recommended in DAM 3, and the management of metadata using the Metadata Catalogue System implemented in DAM 5.

10.4.5 The implementation of the time frame of the 5 CSUs, inventory of GIS Maps, maintenance of file format standards and maintenance of metadata would be discussed in section 12. The ownership of data exchange process and enforcement measures would be discussed in Volume 2I.

10.4.6 Apart from the above, the following suggestions, when considered appropriate, should also be promulgated at a later stage:

(a) It is likely that PDs (Data Users) would be tempted to retain the current practice and continue to obtain the PLW data in the usual way, i.e. try to avoid getting the data through the Data Agent. In view of this, it is recommended in DAM 1 that the current mode of data dissemination from the Data Agent to the PDs (Data Users) would not be maintained. PDs are encouraged to switch from the current mode to CSU data exchange.

(b) There are situations that Data Agent would have to maintain the same data dissemination service to other non PDs (e.g. LandsD disseminate slope maintenance responsibility data to other non PDs). Data Agents are encouraged to review how there processes could be streamlined to improve efficiency.

(c) It is understood that the Building CSU and other CSUs could be made useful to other PDs. It is strongly recommended that the DAM Management Committee should develop a "marketing" plan:

(i) To increase the take up of DAM by PDs

(ii) Extend the DAM to include non PDs.

(d) PDs should be encouraged to make recommendation to the DAM Management Committee on how the DAM could be extended to cover new CSUs and other government departments. Details could be prepared and later published on implementation DAM.

(e) Also, to reinforce with the alignment with the e-Government Policy, practice notes should be prepared to coordinate with PDs on how the investment on GIS could be better synergised, GIS initiatives could be better coordinated and how processes would be reengineered to improve efficiency and effectiveness.

10.4.7 Notwithstanding the recommendation from the PLW Study for an interim DAM prior to DAF implementation, it is worth to re-consider the "interim nature" of DAM as the whole of DAM will take more time than that suggested from the PLW Study recommendation. The overhead incurred / to be incurred for this interim DAM is quite considerable. A more permanent measure is worth for consideration to be in place for DAM, e.g. the interim solution for data dissemination of the five CSUs. The solutions and the overall implementation timeframe for DAM should be closely reviewed with some other evolving initiatives, e.g. need to synergise the investment, as more non PDs might join the DAM or more CSUs developed, might make it more justifiable to speed up the migration from DAM to DAF or to offer a one-stop solution for non GIS users who are able to view the data, perform query and analysis of the PLW data. These non GIS users will not be required to invest separately and operate their own GIS system.

ETWB (Works) and HPLB Technical Circulars

10.4.8 As of 29 January 2003 (ETWB TCW 1/2003), there were in effect about 330 Technical Circulars (TC) at ETWB level (including PWD, Works Branch, LWB and WB Technical Circulars and ETWB (Works) Technical Circulars). There were also in effect 13 HPLB technical circulars.

10.4.9 TCs are grouped into 17 index groups (the index groups as per ETWB TC(W)), among which there is no index group explicitly for the PLW data. The TCs that could be relevant to the exchange of PLW data fall within 2 categories:

(a) Land / Planning / Survey / Environment (Group 12);

(b) Computer (Group 17).

10.4.10 As explained in earlier section, there are some policy gap areas that need to be filled by complementary policies to be promulgated, either through revisions to the current TCs in effect, or issue of new TC would be recommended.

10.4.11 The TCs that DAM implementations would potentially have an impact on, are listed in Table 25:

ETWB(WB) TC Ref No.	**Subject**	**Comment**
19/96	Administration of Digital Geographical Data (PELBTC 2/96)	Should be replaced with a new TC / practice note to include Metadata Cataloge System.
20/96	Documentation for Digital Geographical Data (PELBTC No. 3/96)	Should be replaced with a new TC / practice note to include Metadata Cataloge System.
HPLB TC Ref No.		
2/96	Administration of Digital Geographical Data (WBTC 19/96)	Should be replaced with a new TC / practice note to include Metadata Cataloge System.
3/96	Documentation for Digital Geographical Data (WBTC No. 20/96)	Should be replaced with a new TC / practice note to include Metadata Cataloge System.

Table 25 - List of Technical Circulars related to DAM

10.4.12 There is a need to replace the above TCs with new TC / practice note to include the following on implementation of DAM :

(a) Metadata of selected CSU and Metadata Catalogue System (MCS)

(b) Administration of the MCS

(c) Modes of submission and retrieval of metadata

10.4.13 There is requirement from PDs who asked to improve the current mode of submission of proposal drawings and as-built drawings with respect to its timeliness and how CSWP could be adopted to streamline the process. Such procedure change could be promulgated through revision made to TC 16/2000, proposed as in Table 26.

ETWB(WB) TC Ref No.	Subject	Comment
16/2000	Provision and Collation of Land Survey and Mapping Data	Section 5 of the TC should be revised to enforce timeliness and currency. To facilitate the updating of the proposed information required for both the Building and Road Centreline CSUs, it is recommended: "works departments should pass all proposal plans and as-built plans to SMO for updating the relevant maps and records. Proposal plans of works projects should be passed to SMO at finalisation of preliminary design, final design or at a time when requested by SMO whereas as built plans of works projects should be made available to LandsD within 6 months upon substantial completion of the works. Submission of proposal and as-built plans to SMO shall be made in digital form conforming to the CSWP promulgated in ETWB TC (W) 38/2002."

Table 26 – Technical Circular related to improve submission of proposal drawing and as- built drawing

10.4.14 In parallel with the revisions, a new TC is recommended to promulgate the complementary policy for DAM purpose.

10.4.15 Table 27 summarizes the DAM 4 policy area and the stated objectives to be accomplished in each policy area (marked ✔). The policy needs to be promulgated through issue of new technical circulars unless revision to existing technical circulars could serve the purpose.

10.4.16 It is proposed that a new TC should be prepared to:

(a) Implement the complementary policy to align DAM with the e-Government Policy – road map for the migration from DAM to DAF and the efficiency productivity programme

(b) Implement a management framework to mandate the Provisional DAS Organisation Structure with the terms of reference, organization structure, membership, delegated authority and their responsibility.

Complementary Policy / **Objectives**	**e-Government Policy Road Map and its migration to DAF**	**e-Government Policy Efficiency Productivity Programme**	**Management Framework of DAM**
Set direction on how B/Ds should work together (para. 10.1.3)			
(a). Improve efficiency and effectiveness on exchange of PLW data	✔	✔	
(b). Synergise the investment already invested by PDs on GIS systems		✔	
(c) Align with similar initiatives of other B/D	✔		
(d) Provide continuity and a smooth transition from DAM to DAF	✔		
(e) Institutionalize the issue of CSU specification, requirements for the implementation of the DAM and alignment with e-Government Policy			✔

Table 27 Policy and Objectives

10.4.17 Please refer to Volume 3A for details. The DAM specification and the requirement and implementation details would be published in the practice notes.

Project Administration Handbook

10.4.18 Project Administration Handbook (PAH) is a project management manual for works departments of ETWB. There are eight Chapters in the PAH. They are:

(a) Chapter 1 Project Planning

(b) Chapter 2 Project Approval

(c) Chapter 3 Lands matters

(d) Chapter 4 Project Design and Estimate

(e) Chapter 5 Contract Documents

(f) Chapter 6 Tender Procedure

(g) Chapter 7 Contract Management

(h) Chapter 8 Maintenance and Minor Works

10.4.19 Although this PAH is not directly related to DAM, we would also like to take the opportunity to make recommendation on how the current mode of submission of proposal drawings and as built drawings could be improved to facilitate an efficient and timely update of PLW data which are in the same business domain of the CSU.

10.4.20 There are the following provisions in the PAH which lay out the procedure for submission of proposal and as-built drawings:

(a) Chapter 3 Lands matters – it is required from section 3.3.1 (b) and section 3.3.2 that preliminary project plan / project plan should be sent to DLO and from section 5.4.2 that as built records should be prepared and sent to LandsD.

(b) Chapter 7 Contract Management – there are similar provisions in section 18.3.6 of the PAH.

10.4.21 Notwithstanding the provisions now contained in the PAH (similar provisions also made in section 5 of ETWB (W) TC 16 / 2000), previous experience indicated that these as built records are not available in a timely manner and this makes updating of map record difficult. Table 28 below describes the present status on submission of as built records to LandsD.

Works Department	**Present status: Preparation time prior to submission of as-built records to LandsD**
ArchSD	Normally about 6 months on substantial completion of project.
CED	Normally about 9 months on substantial completion of project (not applicable to GEO).
DSD	As-built drawings (such as river channel) are not sent to LandsD under current practice. Normally it takes a long while before they are completed and available. DSD would follow the recommendation made in this document.
EMSD	EMSD has no particular comment on this issue as it is not applicable to their operations.
HyD	HyD considers that the as-built plans (of digital format if available) for the completed works could normally be made available to LandsD within the following period after certifying substantial completion of the project: - 3 to 6 months for minor in-house projects; - 6 to 9 months for major in-house projects; and - 6 to 12 months for consultant-managed projects.

	Notwithstanding the above, in order to facilitate timely updating of the basic survey sheets by Lands D, HyD has been trying its every endeavour since early 2003 to forward the as-built plans for individual constructed features under in-house projects to Lands D once they have been surveyed (even before the certification of substantial completion of the project).
TDD	TDD does not pass the as-built drawings directly to LandsD. The as-built drawings are passed to maintenance parties, e.g. HyD, DSD or WSD. These Works Departments will forward the as-built drawings to LandsD.
WSD	WSD has no record of providing as-built records to LandsD. WSD will prepare and submit the as-built records to LandsD, in case it happens, in accordance with the time as stated in the Project Administration Handbook.

Table 28 Submission of as-built records to LandsD

10.4.22 Given the current situations documented in Table 28, it is recommended that the timely submission should be encouraged and stipulated as a requirement. With better coordination among project participants in works projects delivery, it is anticipated that Works Departments could manage to send as-built records to LandsD within 6 months on substantial completion of the works projects. As such, section 5.4.2 and section 18.3.6 of the PAH needs to be revised accordingly.

10.4.23 It is recommended that details of the as-built records need to conform to a stipulated softcopy format in order to facilitate timely incorporation of information into each respective systems. This would help LandsD optimize the resources to digest, decompose, convert and check the incoming data, either in digital and paper format.

10.4.24 Also PDs should assist to provide the latest version of the proposal scheme when requested by the Survey and Mapping Office (SMO) of LandsD. Submission of proposal and as-built plans to SMO shall be made in digital form conforming to the CSWP promulgated in ETWB TC (W) 38/2002. Sections 3.3.1(b), 3.3.2 and 5.3 of the PAH need to be revised accordingly.

10.4.25 For consistency, the above provisions in the PAH need to be updated accordingly.

10.4.26 Draft revision to the PAH will be included in the Volume 3A.

Complementary revised policy by Participating Departments

10.4.27 Each PD should also review their own Department Technical Circulars and amend their Technical Circulars accordingly for the implementation of the DAM.

10.4.28 Develop Department IT Plan

(a) The Department IT Plan should include a review on how the existing GIS System should be revamped to address efficiency and effectiveness in data management for all of its various applications/ systems.

(b) Also, to achieve better cost-effectiveness in IT and GIS implementation, systems consolidation and collaboration within department should not be ignored and should be addressed in the Department IT Plan.

11 Costs

11.1 Overview of Costs

11.1.1 It has been agreed among PDs that the implementation of DAM would benefit PDs by streamlining PLW data exchange processes. The same recommendation was also made in the previous PLW Study.

11.1.2 In the recommendation of the previous PLW Study, it was pointed out that the identified tangible benefits from DAM and the investment cost could not breakeven. However, the DAM and DAF strategies should not be considered on the merits of tangible benefits alone. The DAS should be considered as a strategic imperative. It is fundamental in enabling the HKSAR Government's e-initiatives, as this undertaking will involve PLW data. Furthermore, the foundation of any enterprise- wide initiative, such as the HKSAR Government's e-Government undertaking, must include a clear solution around data consistency at an enterprise level, not just within independent departments. This holds true within a corporation, as well as government environment. The successful implementation of a DAS is fundamental to enabling e-Government initiatives based on PLW data.

11.1.3 In the same study, it was recommended that considerations for not pursuing such initiatives due to the lack of highly visible or tangible returns, in the near future, should be avoided. That is, the PD are not positioned to effectively generate opportunities, commercial or otherwise, if there is no DAS in place. On the other hand, they cannot just stand by and "do nothing" within the data alignment area until there are some opportunities to exploit. On the contrary, a move towards a DAS must begin, even if a full DAF solution is not justifiable at this time. Fortunately in the case of this study, some immediate problems within the data currently taking place can be solved using the shorter-term solution, the DAM.

11.1.4 B/Ds are determined to implement DAM. Since new processes would be initiated in the revised workflow on implementation of DAM, PDs would need time to evaluate how these new processes would impact on the resources. It is agreed that the effectiveness of the DAM measures will be evaluated in the Situation Analysis Review (SAR) to be held in end of 2005/ early 2006, subject to confirmation of the implementation period (12 months) originally stipulated in the project Brief.

11.1.5 For SAR purpose, the existing recurrent post-processing efforts are reviewed for cost benchmarking purpose. PDs have reviewed the cost and benefits documents from the previous PLW Study and made some adjustments to the figures. The adjustments made have no impact to the above recommendation. The recurrent cost committed by PDs in the exchange of PLW data is documented in section 11.2.

11.1.6 The cost benchmark, which summarizes the recurrent costs in the current environment, will form the basis on which PDs would evaluate the impact to the recurrent cost on implementation of DAM. A high level estimation on

cost / saving impact will be included in the Final Report whereas a detail evaluation would be conducted in the SAR stage.

11.1.7 Cost estimates associated with the implementation of the CSUs, including the system enhancements and one-off data conversion in PDs will be presented in section 11.3.

11.2 Cost Benchmark

11.2.1 Cost information is collected from PDs on two different occasions:

(a) Current Environment Description (CEDes) (the inventory from the previous Consultancy Study on the Alignment of Planning, Lands and Public Works Data was further confirmed by PDs);

(b) Inventory for DAM 3 (the inventory for file format standards from PDs).

11.2.2 Details of the data exchange processes classified as DAM 1, 2 or 3 is available in Appendix K of Volume 3B.

Current Environment Description (CEDes) - Data Exchange Processes for DAM 1 and DAM 2

11.2.3 Cost benchmark for processes related to DAM 1 and DAM 2 related to the post-processing of incoming PLW data due to data definition (DD) differences and re-symbolization (compatibility of file formats, CF) are derived from the CEDes. According to the previous consultancy study, 169 processes were identified relevant to PLW data exchange. In this project, we have reviewed all of the data exchange processes of PDs in CEDes and re-classified the relevence of each process with respect to each DAM measures.

DAM 3 Inventory - Data Exchange Processes for DAM 3

11.2.4 For DAM 3 related efforts, a separate exercise was conducted to obtain an inventory of data exchange processes involving data conversions (CF and data in digital format, DF), in processing both incoming and outgoing spatial and textual data.

Cost Summary

11.2.5 To quantify the post-processing efforts, an average cost (same from the the previous PLW Study) of HK$1,687 and HK$5,294 per man-day for the respective technical and professional efforts is applied.

11.2.6 A summary of cost for processes relevant to DAM 1, DAM 2 and DAM 3 is presented in Table 29 Cost Benchmark Summary for each PD.

A	B	C	D	F
Participating Dept	**DAM1**	**DAM 2**	**DAM3**	**DAM 1, 2 and 3 TOTAL**
ReferenceSheets	**DAM1(CEDes)**	**DAM 2(CEDes)**	**DAM3 (DAM3 Inventory)**	
ArchSD	0	3,374	0	*3,374*
BD	6,748	0	0	*6,748*
C&SD	330,230	0	76,337	*406,567*
CED	0	0	436,933	*436,933*
DSD	0	211,388	37,114	*248,502*
EMSD	0	50,610	0	*50,610*
HyD	21,105	97,413	88,563	*207,081*
LandsD	8,435	77,313	1,285,282	*1,371,030*
LR	1,076,225	0	0	*1,076,225*
PlanD	285,103	0	63,263	*348,366*
RVD	303,660	0	147,106	*450,766*
TDD	0	0	30,366	*30,366*
WSD	96,964	77,687	114,716	*289,367*
Total (in HKD)	***2,128,471***	***517,784***	***2,279,680***	***4,925,934***

Table 29 Cost Benchmark Summary for each PD

11.2.7 Total cost of all processes relevant to DAM 1 to 3 is approximately HK$5M. The apportioned costs for DAM 1 to 3 are HK$2.1M, HK$517K and HK$2.3M respectively.

11.3 System Revamping and Data Conversion

11.3.1 The overall system revamping costs and one-off data conversion efforts estimated in the 13 PDs amount to HK$14M and HK$7M respectively for the 5 CSUs, as illustrated in Table 30 and Table 31. Most PDs do not have a separate data conversion cost as it's already included as part of the revamping effort. The estimated costs covers the capital costs for -

(a) Procurement of hardware and software license;

(b) System enhancements or data conversion (to be conducted in-house or outsourced) estimated based on the revamping requirements or one-off data conversion exercise to be conducted in PDs; and

(c) Resources required for contract management, when applicable, if the project is outsourced to external consultants.

11.3.2 The detailed breakdown of the above mentioned costs are detailed in Appendix K, which shows the CSU, subject PD, the system name and the respective system enhancement and data conversions costs in detail.

11.3.3 It is to note that the estimated costs do not include:-

(a) Implementation of a centralized CSU database for the dissemination of Building, Lot and Road Centreline CSUs – and a feasibility study supplementary to the LandsD's FS on a Data Dissemination System will be conducted to review if the same infrastructure could be shared for this purpose;

(b) Recurrent costs for the hardware and software components, and

(c) Operational and post-processing efforts (including on-going file format and data conversions) involved in CSU data exchange processes.

11.3.4 The rates used during the costing exercise are based on the same staff costs adopted in the previous PLW Study.

System Revamping						
	Slope	Building	Lot	Road C	TPU/SB	Total
ArchSD	700,000	0	0	0	0	700,000
BD	0	465,000	0	0	0	465,000
CED	1,175,854	0	0	0	0	1,175,854
C&SD	0	492,362	0	0	0	492,362
DSD	500,000	0	200,000	0	0	700,000
EMSD	0	0	0	0	0	0
HyD	1,745,416	0	0	0	0	1,745,416
LandsD	68,884	3,303,825	3,229,821	751,956	0	7,354,485
LR	0	0	0	0	0	0
PlanD	0	353,000	0	0	50,000	403,000
RVD	0	185,900	0	0	0	185,900
TDD	0	0	0	0	0	0
WSD	732,936	0	0	0	0	732,936
Total	4,923,090	4,800,087	3,429,821	751,956	50,000	13,954,953

Table 30 Revamping Costs Estimates in PDs per CSU

Data Conversion						
	Slope	Building	Lot	Road C	TPU/SB	Total
LandsD	0	916,716	148,456	74,228	0	1,139,400
RVD	0	5,791,500	0	0	0	5,791,500
Total	0	6,708,216	148,456	74,228	0	6,930,900

Table 31 Ballpark Figures on Data Conversion Costs

11.3.5 The estimates provided by PDs are also to be used for budgetary purposes, as PDs will make funding applications based on the system revamping and data conversions described in section 5.2.14.

11.4 Cost Estimation from PLW Study and DAM

11.4.1 In the process of cost benchmarking of DAM project, PDs have adjusted the cost figures.

11.4.2 The table below summarizes a comparison between the current post processing cost documented in the PLW Study and the same reviewed in the DAM project:-

PDs	Cost			
	PLW Study		DAM project	
	All Processes[26]	DAM-related Processes[27]	Re-classified DAM processes (Cost Figures before adjustment)	Re-classified DAM processes (Cost Figures after PDs' adjustment)
ArchSD	133,273	0	133,273	3,374
BD	0	0	0	6,748
C&SD	1,997,099	211,784	1,830,415	406,567
CED	91,098	80,976	87,724	436,933
DSD	13,160,798	0	2,085,727	248,502
EMSD	142,107	101,220	109,655	50,610
HyD	924,146	430,878	341,001	207,081
LandsD	2,292,055	0	163,061	1,371,030
LR	1,076,225	0	1,076,225	1,076,225
PlanD	350,896	280,042	285,103	348,366
RVD	3,274,097	3,274,097	935,596	450,766
TDD	65,271	0	30,366	30,366
WSD	40,117,751	155,374	256,241	289,367
Total:	**53,625,115**	**4,534,370**	**7,334,387**	**4,925,934**

Table 32 Cost figures from PLW Study and DAM project

[26] The figures are calculated based on Professional Effort of HKD5,294 and Technical Effort of HKD1,687.

[27] The figures are extracted from Appendix 18 (after page 163) of the Final Report of the PLW Study.

11.5 Investment Cost and Saving from DAM

11.5.1 In the DAM project, PDs were asked to provide estimate on data conversion (one off) and revamping for DAM implementation purpose. The total cost adds up to HK$17.6m.

11.5.2 Table 33 below summarizes a comparison between the investment and the benefit feedback from the PDs:

	Investment Cost		Saving	
	PLW Study	**DAM project**	**PLW Study**	**DAM Project**
Arch SD	-	700,000	0	0
BD	-	465,000	0	6,748
C&SD	-	492,362	242,331	36,325
CED	-	1,175,854	43,862	0
DSD	-	700,000	0	0
EMSD	-	0	25,305	0
HyD	-	45,416	245,805	0
LandsD	-	6,904,655	0	0
LR	-	0	0	0
PlanD	-	403,000	97,846	39,914
RVD	-	5,977,400	1,123,500	0
TDD	-	0	0	0
WSD	-	732,936	42,850	0
Sub total	**6,987,000**[28]	**17,596,623**	**1,821499**[29]	**82,988**

Table 33 Investment Cost and Saving from DAM

Observation

11.5.3 From the PLW Study,

(a) the total current post processing cost (exclude non PDs) for all processes is HK$51.6M.

(b) the overall saving is about 3.5% of current post processing cost (exclude non PDs) .

(c) the investment is approximately HK$7M.

[28] The figures are extracted from Appendix 18, Table under para. 43.2.1 Data (items c,d,e), Technology (items a-h) and Resources estimated in the Final Report of the PLW Study.

[29] Total estimated savings for DAM 1-4.

(d) it was pointed out that the identified tangible benefits from DAM cannot breakeven even the investment cost and it is not cost effective to implement the strategies. However, the DAM and DAF strategies should not be considered on the merits of tangible benefits alone. The DAS should be considered a strategic imperative, as it is fundamental to enabling the HKSAR Government's 'e' - initiatives, as this undertaking will involve PLW data. Furthermore, the foundation of any 'enterprise' wide initiative, such as the HKSAR Government's e-Government undertaking, must include a clear solution around data consistency at an enterprise level, not just within independent departments. This holds true within a corporate, as well as government environment. The successful implementation of a DAS is fundamental to enabling e-Government initiatives based on PLW data.

11.5.4 From the DAM, PDs have reviewed and adjusted the cost and benefit figures, but the same conclusion remains.

11.5.5 We would have expected that there should be a net benefit to the PDs, either in terms of tangible saving, notional saving or intangible savings. The amount should be a fraction of HK$5M (cost benchmarking figure from the DAM project.)

11.6 Benefits

Tangible Benefits

11.6.1 The main tangible benefit, if any, would be attributed to cost savings associated with staff resources in the post processing processes. These saving will come mainly through mitigating the problems that affect the Data Exchange Processes and the resource requirements to address them. PDs who are solely Data Users would benefit from DAM.

11.6.2 C&SD is solely a Data User with saving of HK$36K.

11.6.3 PDs who are take up multiple roles, e.g. Data Users, Data Owners and / or Data Agent would also benefit from DAM. Since they might have to commit additional resources to being the Data Owners / Data Agent, some PDs might have a net overall saving while some PDs would have a net overall increase in recurrent cost to the department. Regardless, there should be an overall benefit to the 13 PDs as a whole. The net effect could be evaluated in the SAR stage.

11.6.4 While the PDs could directly benefit from DAM 1, 2 and 3, some measures duly to be implemented in DAM 4 could also contribute to the saving by synerging the investment on GIS and reengineering the inter-department processes to improve the efficiency and effectiveness. Also some alignment with other initiative, e.g. CSWP could also contribute a saving to the 13 PDs as a whole. For example, exchange of proposal drawings and as built drawings in softcopy format conforming to the published CSWP requirements, when available could also contribute to the savings in post processing effort.

11.6.5 The PDs provided a very high level estimate of the potential savings, amounting to an order of HK$83K, as some of the existing processes would be streamlined thus reducing the post-processing efforts.

11.6.6 Aside from the quantifiable resource cost savings, additional cost benefits savings can be incurred. Examples of additional cost saving benefits are:

(a) Sharing the costs of data production and reducing duplicative efforts that will result, e.g. no need to have more than one PD to maintain podium information;

(b) This will be particularly pertinent to the Government's initiative on electronic services delivery (ESD) because many ESD projects are dependent upon the use of data from various sources;

(c) Reduce development effort by using framework data standards and standardized guidelines and tools;

(d) Utilize data produced by others more quickly through the use of common formats and access methods, e.g. This will help in the preparation of projections for population distribution by geographic areas; and

(e) Reduction of data conversion requirements will occur, lessening the impact on the processing activity (e.g. manual or automated) that may currently be required. This will help PLWB as they embark on the next phase of geographic information system (GIS) development that will focus on asset management. They will be able to tackle data exchange issues more effectively in the early stages of the system life cycle.

Intangible Benefits

11.6.7 In addition, PLW will gain substantial intangible benefits by implementing and leveraging the DAM / DAF components. Although they cannot be quantified, they will be of substantial value to the departments once all their supporting elements or components are properly implemented. The intangible benefits are described below:

(a) Tighter Collaboration - Facilitate tighter collaboration between the Participating Departments and the entities with which they have working relationship.

(b) Reliable Information - The DAM / DAF will provide reliable and timely information, which will in turn assure the user that the content is correct, either as of this moment or at a prior specified point in time.

(c) Appropriate Information Coverage - The departments will gain more confidence knowing that the appropriate information is available to support their major business functions. Any gaps should be well documented, thus setting the correct level of expectation for everyone.

(d) Easy Access to Information - The Catalogue service will improve the accessibility of information by putting on line the list of data available for sharing and the administration arrangements for getting the data.

(e) Satisfying Existing and Future Partners – DAM / DAF will have the flexibility that it could enable the sharing of information with external partners, achieving the government's vision for HK as a regional leader of e- Government. HK being in the unique position between East and West with its bi-lingual population, will have the opportunity to link the Western and Eastern best practices in this area and excels. The adopted standards and practices will be able to extend into the preferred and existing investment of external and international future partners.

(f) Secure Environment - Once responsibilities of custodianship are clearly stated and implemented, it will enable a more secure environment, and emitting a confidence amongst the users. This will provide greater potential to use of the information within DAM / DAF.

(g) Risk Minimization - With the introduction and acceptance of an inter-departmental strategy around data alignment, risk associated with any related projects should be reduced. Once appropriate policy and procedures are put in place to help enforce and streamline the data exchange initiatives, together with a blueprint such as the DAM / DAF, there should be a higher degree of success associated with such projects.

(h) Reduction of Data Duplication - Other intangible benefits that could be realized include areas such as savings around the maintenance and storage of duplicated data. Within this study, the ability to estimate this was not possible due to the level of detailed understanding required around the current state of data duplication. However, as the DAM, and a more complete DAF is rolled out, savings through the reduction of duplication of data, and effort to maintain it, could prove to be notable.

(i) Synergy with other Government Data related Initiatives

(i) There have been a number of projects identified that dovetails with this Data Alignment study. Once the data alignment project aligns (or negotiate alignment) with these projects, such alignment will bolster the success of each project and minimise project risks.

(ii) Any future data alignment initiatives also need to comply (or negotiate) with the existing policies and organisational arrangements, with the possibility of invoking process realignment efforts within the necessary areas.

Commercial Benefits

11.6.8 As had been noted in the PLW Study, there are additional benefits that have been achieved, directly or indirectly through increased government accuracy and alignment of data in conjunction with GIS.

12 Implementation Schedule

12.1.1 The preparation time prior to implementation will vary by CSU:

(a) Slope CSU - 12 elapsed months

(b) Building CSU - 15 elapsed months

(c) Lot CSU - 14 elapsed months

(d) Road Centreline CSU - 11 elapsed months

(e) TPU / SB CSU - 4 elapsed months

12.1.2 It is from the original project brief that 12 months are allowed for DAM implementation. In view of the procedures required for procurement of funding resources, prior studies, system enhancements and data conversions, more time is required prior to implementation of DAM. Given the preparation time required for CSU and on the assumption that the data conversion and system revamping schedules will commence in early 2004, the overall implementation timeframe is illustrated in Figure 31:

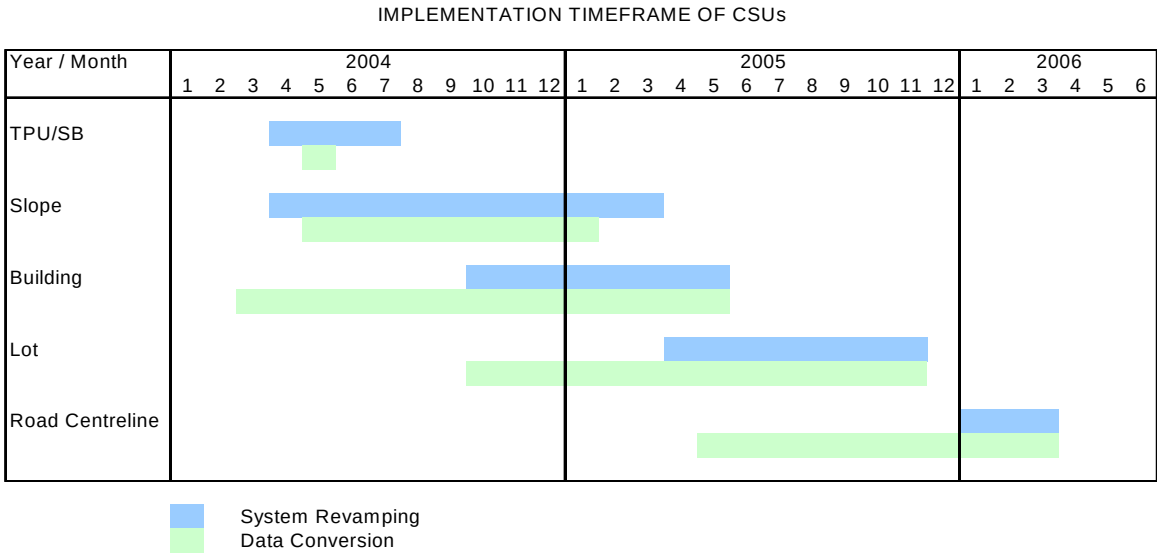


Figure 31 Implementation timeframe of CSUs

12.1.3 Schedule for DAM 1 CSUs:-

(a) TPU / SB CSU can be implemented in Q2

(b) Slope CSU is scheduled to be implemented by mid 2005

(c) Building CSU, Lot CSU and Road Centreline CSU are not likely to be implemented before mid 2005 since the respective one-off data conversion exercise would take around 15 man-months to complete:

(i) Building CSU is prioritized to be implemented first, to be available by Q2 2005

(ii) Lot CSU will be implemented in late 2005

(d) Road Centreline CSU will be implemented in Q1 / Q2 2006

12.1.4 Schedule for DAM 2:-

(a) DAM 2 will be effective by July 2004. The GIS map-producing PDs may produce departmental symbol specifications according to recommendations in DAM 2 as an on-going maintenance effort and availability of the required data conversion tools

12.1.5 Schedule for DAM 3:-

(a) File Formats Standard recommended in DAM 3 would be implemented as follow:

(i) In the situations where PD develops a new system for non-CSU geospatial PLW data exchange process, File Format Standards (recommended in DAM 3) should be adopted in the development of new systems that will interact with the systems of other PDs, with effect from 2 July 2004.

(ii) In the situations where the data exchange processes are related to CSU data(unless otherwise agreed between sender and receiver). File Format Standards (recommended in DAM 3) should be adopted as per the implementation schedule of the respective CSUs.

(iii) In the situation where PDs encountered data conversion problems in exchanging non-CSU geospatial PLW data produced from the existing systems of PD, and the problem could be resolved by File Formats Standard, PDs are encouraged to adopt File Format Standard in the data exchange processes. There is no set time frame for this.

(iv) When the Data Exchange Process is related to non-CSU geospatial PLW data and such process involves only existing systems and there is no file format conversion problem in the process, File Format Standard compliance is not applicable, i.e. maintain current practice.

(v) Similar to (iv) above, File Format Standard compliance is not applicable in the situations when the data exchange problem needs to be resolved by other means.

13 Way Forward

13.1 Advance Tasks

13.1.1 Addition to the planned system revamping and data conversions, a number of advance tasks are recommended. These include, but not limited to the following:

Item	Tasks Descriptions	Related DAM	Action By	Recommended Target Dates
1	Work together and identify if there is inter-department processes good for business process reengineering purpose.	DAM 4	All PDs	Q2 2004
2	Submit funding application, when applicable; make resources available according to the implementation plan of DAM	All	All PDs	Q2 2004
3	**Create and submit Metadata** GIS PDs who have not complied with 2/96 and 3/96 in generating metadata for their geospatial data or submission to LandsD are recommended to do so.	DAM 4 DAM 6	All GIS PDs	Q2 2004
4	**Update Geoguide5 specification to mandate slope submission in softcopy.** CED to specify the file formats, layers used, coordinate system and relevant backdrop information for future softcopy submission of slope information in GeoGuide5	DAM 1 Slope CSU	CED	Q4 2004
5	**Provide training to slope data source agents.** CED to provide training to Slope Data Provider. CED to arrange training to business partners with an aim to promote awareness and knowledge in the classification of slope types and how slope boundaries can be correctly presented in the submission process.	DAM 1 Slope CSU	CED	Q4 2004
6	**Revise B1000 Specification** Revise the B1000 specification to include the delineation of podium polygons.	DAM 1 Building CSU	LandsD	Q1 2004 (commence)

Item	Tasks Descriptions	Related DAM	Action By	Recommended Target Dates
7	**Improve data quality of Road Centreline CSU** As there may be inconsistent definitions in the delineation of existing flyovers and roundabouts, it is recommended that LandsD handle such cases in its maintenance by gradual adoption of the new "Street Centreline Placing Guidelines v1.0" in existing road centerlines.	DAM 1 Road Centreline CSU	LandsD	Early 2004 (com.-mence)
8	**Provide training to GIS PDs** LandsD should provide training to GIS PDs for preparation and submission of metadata to Metadata Catalogue System (MCS)	DAM 4 DAM 6	LandsD	Q2 2004
9	**Enhance IRIS for Lot CSU as per Lot CSU implementation schedule.** LR to revise the administration and operation procedures and carry out enhancements recommended:- a. Lot ID in C1000 Format to be captured in IRIS b. An IRIS External Interface for the CSU c. Memo to contain PRN d. Relation between Parent Lot and Sub-divided Lot registers in Carving Out to be Captured in IRIS e. Lot Resumption Information	DAM 1 Lot CSU	LR	Q3 2004 (com-mence)
10	**Approach candidates for GIS advisor and BPR advisor** HPLB should approach suitable candidates for the position of GIS advisor and BPR Advisor	DAM 4	HPLB PDs	Q1 2004
11	**Arrange all PDs to sign on a common agreement for DAM implementation.** HPLB to coordinate all participating B/Ds (represented by directorate staff of B/Ds) to sign on a common agrement with the said objectives.	DAM 4	HPLB PDs	Q2 2004
12	**Develop a plan to extend DAM to non PDs** Actions include but not limited to:- o initiate conversation with PDs and non PDs to study the necessity and feasibility of a new CSU – multi-road centreline o invite non-PDs to participate in the DAM	DAM 1 DAM 4	HPLB	Q2 2004

Item	Tasks Descriptions	Related DAM	Action By	Recommended Target Dates
13	**Design common XML schema for CSUs** Pure textual data exchange may involve in data provision process of Slope, Building and Lot CSUs[30]. A common XML schema for CSUs shall be designed in compliance with the standard defined in Interoperability Framework v2.0.	DAM 1	HPLB	Q2 2004
14	Enforce PDs' submission of metadata to Metadata Catalogue System (MCS) which is hosted by LandsD.	DAM 4 DAM 6	HPLB	Q2 2004
15	**Facilitate funding applications** HPLB should work out with CITB and see if there is an effective mechanism to improve the information sharing which would in turn help the policy bureaux make decision in respect of funding approval, policy support to funding application.	All	HPLB CITB PDs	Q1 2004
16	**Develop policies to coordinate GIS initiatives** HPLB to coordinate the GIS initiatives at Planning and Lands Branch Information Technology Committee (PLBITC) and to transfer the role to DAM Management Committee. HPLB shall also coordinate participating B/Ds (represented by senior directorate officials) to sign on a common agreement with the said objectives.	All	HPLB	Q2 2004
17	Issue new TC and/or revision of TCs for the promulgation of complementary policies on the implementation of DAS	DAM 4	HPLB ETWB	Q2 2004
18	Follow-up with CSWP on layer naming to address exchange of CSU data when the data is submitted in DGN or DWG format	DAM 4	HPLB ETWB	Q1 2004

Table 34 Advance Tasks

[30] Data for Road Centreline and TPU/SB CSUs are solely owned by LandsD and PlanD respectively. Its exchange processes should involve geospatial data. Data involved should comply with DAM 3 and without the necessity to deploy XML.

13.2 SAR

13.2.1 It is scheduled that the following tasks would be carried out in the SAR:

(a) Reflect (measure) the achievements (i.e. benefits) resulting from the DAM implementation;

(b) Identify areas to improve going forward (i.e. organizational structure and processes, DAF Components, etc.);

(c) Identify new opportunities to consider (i.e. new applications, commercial opportunities) which may not have been known or available before;

(d) Obtain a revised picture of the current state (i.e. 1+ yr. later) of PLW data exchange environment, requirements and activity;

(e) Identify future resource and costing considerations to evolve the DAF based on the current state of PLW data exchange environment and requirements;

(f) Gather information to help determine the potential scope, focus and priority when evolving all or some of the remaining DAF components further as per the DAF strategy;

(g) Improved capability to determine the viability of evolving all or part of the remaining DAF components as per the DAF strategy.

13.2.2 After the situation analysis has been completed, identify implementation considerations relating to the remaining DAF components as per the DAF strategy. This is regarding the requirements to satisfy the overall DAF strategy and resolve the remaining problems not covered by the DAM (i.e. compare what has been implemented vs. what is felt to be pending – Standards component, etc.). This will help determine the scope, focus, priority and additional activities that need to be considered other than what this study has identified. In addition, this will be useful when determining and assigning resources to the tasks.

13.2.3 In the PLW Study, the below DAF Components were proposed:

(a) Data

(b) Metadata

(c) Catalogue

(d) Technology

(e) Standards, and

(f) Partnership

13.2.4 The framework is base on the National Spatial Data Infrastructure (NSDI) which was promulgated by the US Federal Geographic Data Committee (FGDC). More information about NSDI is available in http://www.fgdc.gov/nsdi.

13.3 Migration from DAM to DAF

More than interim solution

13.3.1 PLW Consultancy Study recommended DAM as an interim solution prior to the long term solution DAF. It is worthwhile to re-consider the "interim nature" of DAM as the whole implementation of DAM will take more time than that suggested by the PLW Consultancy Study. The overhead incurred/to be incurred for this interim DAM is considerable, e.g. the interim solution for data dissemination of the five CSUs. The solutions and the overall implementation timeframe for DAM should be closely reviewed with the evolving initiatives from the B/Ds. These initiatives might further justify the migration from DAM to DAF or the offer of one-stop solution for non GIS users to view, query and analyze PLW data.

Proactive to start preparing for DAF

13.3.2 In the evolving technology environment, interoperable enterprise level spatial databases, GIS applications and web applications are available. That is, technology issue is not an obstacle. The ability to put in place shared IT infrastructure and technical resources (i.e. hardware, software, and staff) and determination to overcome institutional barriers (e.g. generate new culture on resources sharing) are the key issues and success factors. Adequate capital resources, human resources and institutional framework are all required and should be well collaborated to support the development of a common spatial Data Hub and Portal that could meet the day-to-day needs of the PDs.

13.3.3 To prepare for the migration to DAF, PDs currently working with antiquated, unsupported, or non-interoperable versions of GIS systems must be ready to transform their existing GIS platforms and make them compatible with the DAF. These GIS platforms should be upgraded to current-day interoperable versions. The users should be trained and be able to use the modern GIS effectively, taking advantages of many of their new productivity enhancing features.

13.3.4 For DAF purpose, requirements to meet the needs of all the other PDs will likely transcend the resources and institutional will of any one PD. It will need a strong and well represented, efficient and effective management framework to be responsible for the overall management. A GIS expert at the bureau level with practical implementation experience will play an important role and is an essential element to the long term success and formulating visionary yet pragmatic policies.

13.3.5 To be successful, such an agent must be chartered with a formal mandate to administer the Data Hub and Portal. This includes coordinating the installation, support, ongoing maintenance, and continuing upgrades of the DAF's intranet network hardware and software, enterprise-RDBMS, and interoperable GIS. The agent's (or Department's) budget needs to be appropriately sized. Its organizational structure must be sound, and the staff and leadership must be knowledgeable, experienced, and motivated to do a great job for their clients. With all this in place, the most important key success factor would then be buy-in

and practical support of all key PDs involved in spatial data and map creation and use.

13.3.6 With the key issues of infrastructure, cultural change, budget, organization and staff resources resolved, the final key success factor would be proper placement and representation of appropriate expertise in the DAF Organisation structure and Implementation Team. With this in place, the management framework can assume a leadership role and successfully administer its responsibilities to implement the DAF.

Symbology

13.3.7 In principle, standardisation should be in a broader sense. PDs should have the ability to replicate (or reproduce) the symbology used by the map producing departments. PDs (mainly GIS users) should be encouraged to share their own legends and symbology, but not mandatory. Map producing departments should be encouraged to market their own developed legends and symbologies. This is useful for the non PDs who could be minor GIS users and they then do not have to rebuild their own legends and symbology.

13.3.8 PDs in HK are not active to market their own symbols since by default everyone follows LandsD. Nevertheless, on implementation of DAF, it is worth to consider setting up a symbol library which could be a database populated with a collection of symbol specification for all symbols used within shared Map Producing PDs. Other inventory of metadata could also be maintained in the symbol library: map-series, data source, Entity, Theme, and cross-reference to a standardised feature code.

Metadata

13.3.9 Currently, only a few departments submit their metadata to LandsD as required by the PELB and Works Branch TCs.

13.3.10 Although LandsD could follow up with reminders to ask PDs to submit metadata, such effort is not constructive. PDs should be encouraged to commit resources to prepare their first set of metadata and its subsequent maintenance.