

**TERMS OF REFERENCE FOR PROVIDING THE
CONSULTANCY SERVICES OF**

***Production and establishment of cartographic database for scale
1:100,000 and production of TM100 product specifications***

LIST OF ABBREVIATIONS

<i>STOKIS</i>	<i>Official Topographic and Mapping Information System</i>
<i>CROTIS</i>	<i>Croatian Topographic Information System</i>
<i>BTD</i>	<i>Base topographic database</i>
<i>CD25</i>	<i>Cartographic database in scale 1:25000</i>
<i>TM25</i>	<i>Topographic map in scale 1:25000</i>
<i>VOGIS</i>	<i>Military geographic information system</i>
<i>UML</i>	<i>Unified Modeling Language</i>
<i>CIS</i>	<i>Cartographic information system</i>
<i>TM100</i>	<i>Topographic map in scale 1:100000</i>
<i>GIS</i>	<i>Geographic Information System</i>
<i>WMS</i>	<i>Web Map Service</i>
<i>WFS</i>	<i>Web Feature Service</i>
<i>CD100</i>	<i>Cartographic database in scale 1:100000</i>
<i>TD100</i>	<i>Topographic database in scale 1:100000</i>
<i>HTRS96/TM</i>	<i>Croatian projected coordinate system</i>
<i>CRSU</i>	<i>Central register of spatial units</i>
<i>TD</i>	<i>Topographic database</i>
<i>CD</i>	<i>Cartographic database</i>

TERMS OF REFERENCE FOR PROVIDING THE CONSULTANCY SERVICES OF

Production and establishment of the cartographic database for scale 1:100,000 and production of the TM100 product specifications

1. Background

Pursuant to the Law on State Survey and the Real Property Cadastre (OG 16/07 and 124/10), the State Geodetic Administration is responsible for the production of state maps whereas the Rules and Regulations on Topographic Survey and State Maps Production (Official Gazette 109/08) essentially describe the process of establishing cartographic databases and production of state maps.

The STOKIS (official topographic and mapping information system) concept envisages the production of topographic and mapping data models, and their implementation through the establishment of topographic and cartographic databases.

CROTIS (Topographic Information System of the Republic of Croatia) defines the basic topographic data model and its implementation has been carried out with the creation of the Basic Topographic Database (BTD). With regards to the activities related to further implementation of the STOKIS project, concept studies have been developed offering a draft cartographic data model, describing the manner of establishing a cartographic database and proposing a catalogue of features to be contained in the CDB25 cartographic database.

The topographic data are contained in the BTD and serve, along with the digital terrain model data, to produce the first draft of topographic maps in the scale of 1:25,000 for the entire territory of RoC. The primary source for the map production was aerial photogrammetry or rather topographic data collected on the basis of aerial photogrammetric shots.

As a follow-up to the BTD and TM25 and pursuant to the agreement related to official cartography, the Ministry of Defence has initiated the VOGIS project aimed at creating the military and geographic system and production of topographic maps in the scale of 1:50,000 and 1:250,000.

2. Objective

- a. Establish a cartographic database (CD) for the scale of 1:100,000 (CD100) and develop a corresponding specification containing the definition of the data model (written in UML). In order to manage the CDs, it is necessary to establish a cartographic information system (CIS). The CIS establishment involves the production of a system for efficiently maintaining and presenting cartographic data, and a system for the production of TM100 products.
- b. Establish GIS web services (WMS and WFS) enabling the display of the data from the cartographic database (CD100) and topographic maps (TM100).

- c. Develop the TM100 product specification and carry out the implementation of the TM100 specification by producing three sheets of the topographic map in the scale of 1:100,000 from the CD100 data. The TM100 map sheet should be produced in accordance with the new sheet division and in the new HTRS96/TM cartographic projection. The area coverage will be defined in the course of procurement procedure, in the invitation to submit the financial and technical parts of the bid.
- d. Define the elements and quality procedure for: established cartographic database and TM100. Integrate control mechanisms into the CIS.

3. Scope of services and tasks

3.1. Introduction

The territory of the Republic of Croatia is fully covered by topographic maps in the scale of 1:25,000 (TM25) in analogue and digital (raster and vector) form as well as topographic data contained in the BTM (established on the basis of the CROTIS data model) for the entire territory of RoC. Based on the BTM data, the production of topographic and cartographic databases and maps in the scale of 1:50,000 and 1:250,000 has been initiated for the needs of the Ministry of Defence.

This data is the basis for establishing the databases and datasets in the scale of 1:100,000.

3.2 Original data

The BTM is used as a dataset starting point. The BTM serves to generate all further topographic and cartographic databases (in line with the Rules and Regulations on Topographic Survey and Production of State Maps (OG 109/08)).

Topographic data is being updated, throughout the SGA topographic and cartographic product system (Figure 1) by regularly updating the BTM, followed by all BTM changes being transferred from the other derived database.

The topographic data for certain topographic databases (TD) of smaller scales are derived by implementing modelling generalisation by having modelling generalisation performed for each following TD of smaller scale on the basis of previously established TD of bigger scale.

In order to produce the cartographic database (CD) for a certain scale, cartographic generalisation of the TD of corresponding scale should be performed.

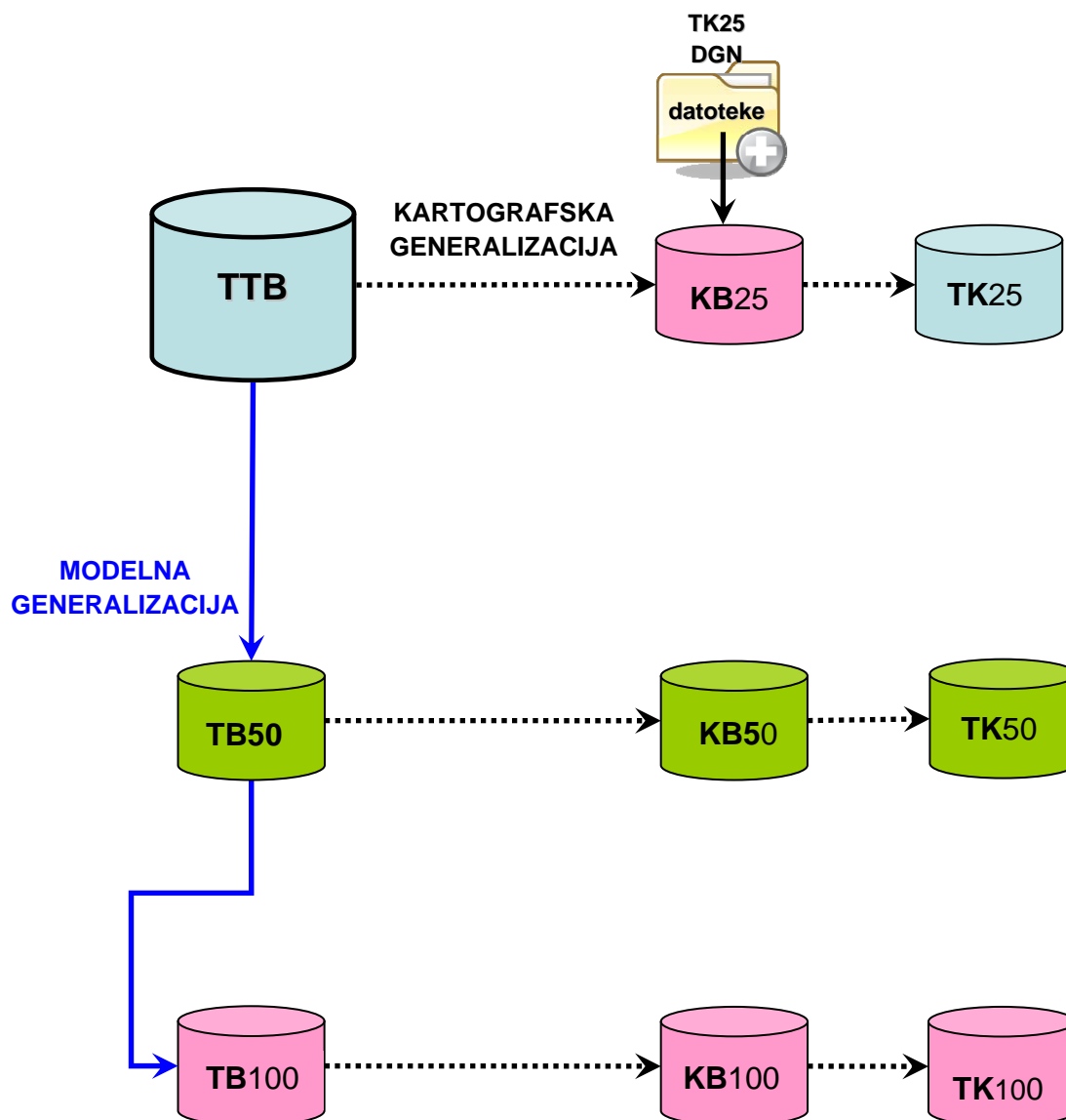


Figure 1: Schematic overview of the production of the topographic and cartographic product system

3.2.1. Original for TD100 and CD100

According to the methodology described in the Rules and Regulations, the CD100 should be established by implementing cartographic generalisation with the TD100 data.

For it to become possible, the Consultant should first establish the TD100 by modelling generalisation from the MoD topographic database in the scale of 1:50,000 „TD50“ taken over from the SGA.

3.2.2. Original for TM100

The Consultant shall perform and configure the CIS "ready to use".

With the help of the installed GIS application it should be possible to develop from the CD100 standard output in the scale of 1: 100,000 (raster TM100 file, pdf file, TM100 fit for printing) without additional CD100 data processing.

3.3. Terms of Reference

This project shall encompass the following operations:

- a. Develop the data model of the TD100 topographic database described with UML. As part of the modelling, it is necessary to produce the TD100 feature catalogue.
- b. Establish the TD100 by performing modelling generalisation of the topographic data from “TDB50_VMap2“ into TD100.
- c. Develop the CD100 data model and describe it with UML.
As part of the modelling it is necessary to produce the feature catalogues and produce the required documentation to define both databases (TD100 and CD100).
- d. Develop a schema of the CIS architecture overview (CD100 management system). The CIS should enable: work with the data from the cartographic database (data editing, data addition, data deletion etc.) and linking with other databases of the State Geodetic Administration (TDB, CRSU, toponyms database, permanent geodetic points database), TM100 output development (analogue and digital) and presenting the data of the cartographic database to users. The definition and specification of server and client components should be performed in cooperation with the Client.
- e. Produce, install and deliver the adopted program system for the CIS (HTML application for CD100 data presentation and a GIS application to produce the TM100 products)
- f. Establish WMS and WFS services that will enable the display of the data from the cartographic database (CD100) and topographic maps (TM100).
 - The WMS service shall display the TM100 maps and corresponding sheet divisions
 - The WFS service shall display the CD100 layers grouped by theme – that are of interest for physical planners and other institutional users The themes to be displayed shall be defined during the task execution.
- g. Produce a HTML application to enable the presentation of WMS and WFS services to users. The HTML application must enable the use of rather download of WMS services’ data of the SGA Geoportal (CRSU, toponyms database, permanent geodetic points database, DOP, BCM...).
- h. Implement models for TD100 and CD100, including the establishment of the topographic and cartographic database on the open code spatial database (PostGIS...)
- i. Perform the upload of available TD100 data on the basis of **three** TM100 sheets.
- j. Perform the upload of available CD100 data on the basis of **three** TM100 sheets.
- k. Test CIS system and TD100 and CD100 contents
- l. Develop the user instructions for working with CIS and train the SGA staff. The education should be performed on the premises of the State Geodetic Administration for two employees at the administrative level and for four employees at the user level.

The part of the project concerning the development of the TM100 product specifications and implementation in the test area encompasses the following operations:

- 1) Develop the TM100 product specification (whose structure confirms to the existing TM25 specification) with the following content:
 - Introduction
 - Terminology and abbreviations
 - Document history (logbook of changes, reference documents)
 - Document purpose
 - Background (in general, the TM100 use, potential users, originals, previous products, language)
 - Requirements (coverage, coordinate reference system, altitude system, map demarcation), manner of collecting and displaying data of neighbouring countries
 - Delivery (list of deliverables, report, digital data, analogue data – map, file naming...)
 - TM100 production process
 - Cartographic generalisation for the 1:100,000 scale
 - TM100 printing
 - TM100 topographic map content (cartographic key)
 - Sheet nomenclature (new division in TM100 sheets)
- 2) Production of **three** TM100 sheets. The area coverage will be defined in the course of procurement procedure, in the invitation to submit the financial and technical parts of the bid.
- 3) Define the TM100 quality elements and describe the process of quality control of each quality element.

4. Outputs

- a. TM100 product specification describing: TM100 content, TM100 production process, TM100 cartographic key, cartographic generalisation for the 1:100,000 scale.
- b. The documents defining TD100 and CD100 with the remark that the submitted documents must contain the data models with the database contents described in detail, and procedures of modelling generalisation from TD50 into TD100. The documents must be written in such a way as to enable the re-establishment of TD100 and CD100 and of the procedures for downloading from TD50 into TD100.

As part of the documentation submitted, the Consultant shall submit all the required additional files that can assist the performance of the above-mentioned action (e.g. workspace files for FME...).
- c. The TM100 and CM100 established on the basis of open code (Post GIS or similar) with downloaded data on the basis of **three TM100 sheets**.
- d. Cartographic information KD100 management system The system should represent an efficient solution in terms of maintaining the cartographic data, presenting cartographic data and producing the TM100 products.
- e. Established, tested and documented production process for TM100 products (by using GIS tools).

- f. The established CD100 (WFS and WMS) web GIS services.
- g. Enabled maintenance (periodic and at invitation) of the implemented system (CIS) for the period of 12 months after the Project close.
- h. The user manual for working with CIS handed over to the Client, SGA staff training completed.

5. Quality Control

The CIS must have an integrated data quality control system, given the Cartographic Database model requirements or rather quality control requirements (logical consistency) for all elements to which automated procedure could be applied.

In the TM100 specifications part related to the production, the internal quality control system must be described or rather the quality elements for analogue and digital products should be defined. The results of the completed internal quality control as well as the description of the control implementation for each quality element must be documented.

The quality control procedures must be in accordance with the existing quality control documents in line with the ISO 19100 standard series methodology. Operational tables where quality control results are inscribed should be produced for the quality control execution.

6. Acceptance of completed works

During the implementation of this Contract, the technical activities will be adopted by the State Geodetic Administration in accordance with the requirements in the technical specifications.

The criteria for accepting Project results for the establishment of cartographic databases are:

- Functioning of information systems (CIS) with the ability of realising the requirements defined by the Technical Specifications (data upload, data edit, data addition, data deletion).
- Linking to other databases of the State Geodetic Administration (Base Topographic Database, SUCR, toponyms database, permanent geodetic point database).
- Defining TM100 outputs (analogue or digital).
- Presenting data of the Cartographic database to users, functioning of web services for uploading data on observed changes.

The criterion of accepting results of the TM100 Product Specifications Development Project is the implementation of the produced specifications in the production of the TM100 test sheet with the performed quality control i.e. fulfilling the conditions defined by the Technical Specifications.

7. Approach and Methodology

The Law on State Survey and Real Property Cadastre (OG 16/07 and OG 124/10) and the Rules and Regulations on Cadastral Survey and State Map Production (OG 109/08) are the basic documents regulating the area of the State maps' production and cartographic database establishment.

Pursuant to Article 23 of the Rules and Regulations on Cadastral Survey and State Map Production (OG 109/08), the basic principles of establishing topographic and cartographic databases are conformant to STOKIS.

For the purpose of establishing the cartographic databases the studies developed under the STOKIS project will be used along with the newly adopted specifications:

- STOKIS (June 2002): “Cartographic data model”
- STOKIS (August 2002): “Establishment of Cartographic and Topographic Database”
- STOKIS (April, 2003): “Graphic and Alpha-numeric Code System of State Topographic Maps”
- SGA (2011): Topographic data product specification (v. 1.2)
- SGA (2011): TM25 product specification (v. 1.2)
- SGA (2011): CROTIS v. 1.2
- SGA (2014): CROTIS v 2.0

All the afore-mentioned works should be performed in accordance with the corresponding existing regulations and instructions given to the contractor by the State Geodetic Administration.

After the successful completion of this task, all documents and products remain the property of the SGA that disposes with them as prescribed by Law.

The Client shall provide free of charge all required data, documentation and information related to the implementation of this task that are the SGA product or property and the technical assistance, as needed.

The Consultant shall ensure the entire office space, equipment, materials, transportation costs and additional costs that are required for the execution of this task.

All data that have been or will be submitted to the Consultant for the purpose of performing this task and all the data created after the completed works remain permanent property of the

State Geodetic Administration and may be used only for the purpose of performing the works that are defined in this technical specification.