

Chapter 18. Tactile Cartography: Essential for the Visually Disabled

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1. Introduction

Cartography is a science of visual communication that enables the human being to locate him/herself in the geospatial surroundings and to graphically portray that space. In that science, there are various sub-disciplines, which are used and presented through a range of cartographic products, one of these being Tactile Cartography.

Tactile Cartography portrays geographic reality through relief and textures on a range of standard objects such as maps, models and boards. These are created on various materials to be sensed by touch. Cartographic products are intended mainly for people with a visual handicap, but may also be used by all those who use their sense of touch.

Within the conceptual framework of tactile cartography, the development and production of tactile materials are processes that integrate the self-teaching by blind people with those who desire to learn or to teach this science.

2. The Braille System, fundamental for Tactile Cartography

The Braille system is strongly linked to the development of tactile cartography. "Braille presents information derived from oral language: everything that we talk

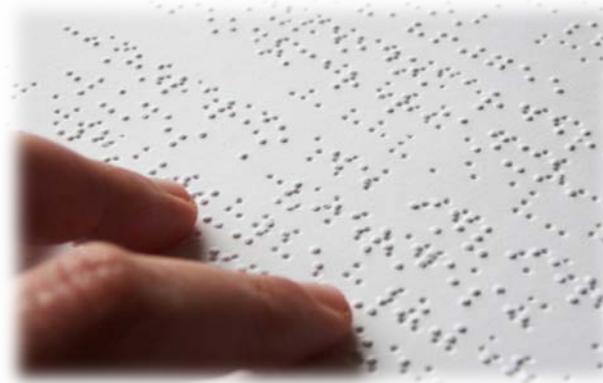


Fig 18.1 a. The figure shows some information for explanation of the cartographic product in figure 18.1 b.

about, feel, think, see or touch can be communicated as written language through this system, which enables one to incorporate meaningful communication into the features included in the cartographic products" (T. Barrientos, 2004).

This major system of writing and reading for visually handicapped persons enables access to all kinds of text, and, consequently, to knowledge of spelling, punctuation signs, the general structure of the text, also to the information contained in maps, models and adapted hard sheets and boards.

3 Methodologies for tactile cartography

For creating the tactile cartographic products, there is a systematic process for achieving an optimum result that is of real, practical use to visually handicapped persons. As follows, the stages of the production process are

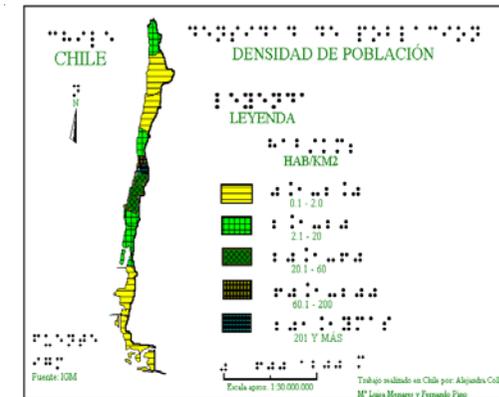


Fig 18.1 b shows the population of Chile as a map for blind.

outlined, concerning the tactile cartography that is made at the Tactile Cartography Centre – CECAT – of the Metropolitan Technological University – UTEM – in Santiago, Chile.

3.1. Stages in creating tactile cartographic Products

3.1.1 Research in background bibliography:

Gathering information about the themes to portray, adapting the material to the available technologies.

3.1.2. **Current status:** Checking the quality and the relevance of the bibliographic material with is available and of the technological methods for making the cartography.

3.1.3. **Objectives - proposals:** Define the objectives of the topic to cover, in accordance with the target requirements and context. Adaptation of the base information

(territorial data) on which the tactile cartographic products will be established, involving various methodologies and designs for cartographic products.

3.1.4 Design of the base cartography and the symbology: Four fundamental processes are configured at this stage: (1) the geographic space or area to be portrayed, (2) the geographic sources and the search for basic maps, (3) the scale and format of the piece to produce, (4) the tactile symbology studied and designed.

3.1.5 Designing and making the model: The information and the type of material that the prototype map is to contain are determined. This process involves making the modules, producing the prototype and assessing the material.

3.1.6 Optimizing the tactile cartography: In this process, the final product is improved and the mock-up is then validated before serving as the model for making the maps by thermoforming.

3.1.7 Making the final cartographic material: On the basis of the mock-up, thermoform printing is then carried out to make the cartographic sheets in accordance with the requirements established, so that the product can finally be used by blind persons.



Figure 18.2 shows a prototype or mock-up (left) and a thermos-formed sheet (right).

3.1.8 Distribution of the tactile cartographic material: Finally the tactile map product is distributed in accordance with the objectives of the visually disabled user, from a business or an institution.

3.2 Fundamental Features of Tactile Maps.

The features that the tactile maps and/or sheets contain are determined by some of the following attributes: the north direction, scale (graphic and numeric), symbology, textures of the materials that portray the concepts, among others. These features are defined in the following sequence:

3.2.1 Design and creation of thematic symbols for the moulds: This stage involves designing and setting out in diagrams the information to go in the margins of the maps, also defining and choosing the symbol systems. The base cartographic information is converted to digital media.

3.2.2 Design of the Braille content: When the information in the tactile product has been defined and confirmed, each one of the texts is designed in Braille form. Normally these take up twice as much space as conventional text printed in ink. This is a major challenge for production, above all when creating tactile cartography, because in most cases the map users find legends that contain not only tactile symbology but also Braille symbology.

3.2.3 Application of a previously evaluated symbology: In each of the cartographic products and, in some specific cases, in the tactile boards, tactile symbols are used that have already been submitted for assessment at various organizations and have had an acceptance rate of between 80 and 95% in terms of being understood for the various themes being portrayed.

3.2.4 Creation of digital map base and graphic boards: To achieve an optimum result in the creation of tactile cartography and/or images, it is essential to have available a suitable and updated base map, which can be obtained from governmental entities or alternatively created by in-house cartographers.



Figure 18.3. Assessment of tactile maps.

3.2.5 Creation of cartography and its tactile legend: The cartographic material is configured on the basis of small or large scales, depending on the size of the objects to be portrayed, with textures and colours to represent area, point and line features. For making the mould (to produce the final item), the physical materials and their configuration are studied, in order to ensure its durability over time, thus enabling a commitment to produce a given volume of items over time.

3.2.6 Visual-tactile printing system for thermoformed plastic: Printing of the cartographic models is generally performed on transparent PVC plastic by means of the thermoforming process, which makes it



possible to add a coloured board with the same information that has been called visual-tactile. The use of colour is important for differentiating aspects that need to be noticed in the case of users with limited vision. For that reason, the study and the application of colour to the thermoformed models and the creation of trial prototypes is a major step towards achieving the final product. Another alternative studied is that of special large-size printing, but due to the high cost relative to small production volumes, this has not yet been implemented.

Depending on the location of the tactile cartographic product, the issues of greater durability over time - having a different physical setup if placed within a document, in a closed place or in an outdoor site exposed to the weather - are being researched.

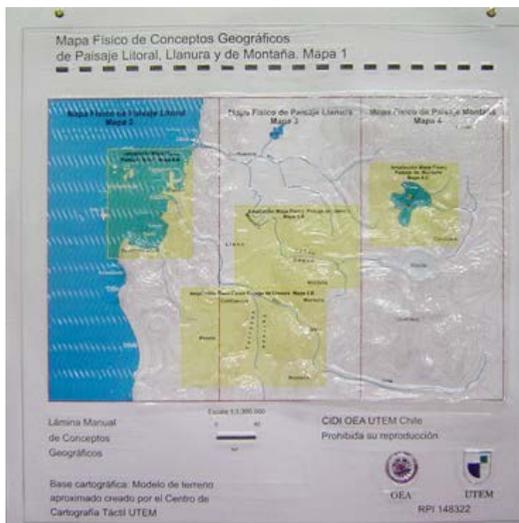


Figure 18.4 Visual-tactile map and legend of Chile.

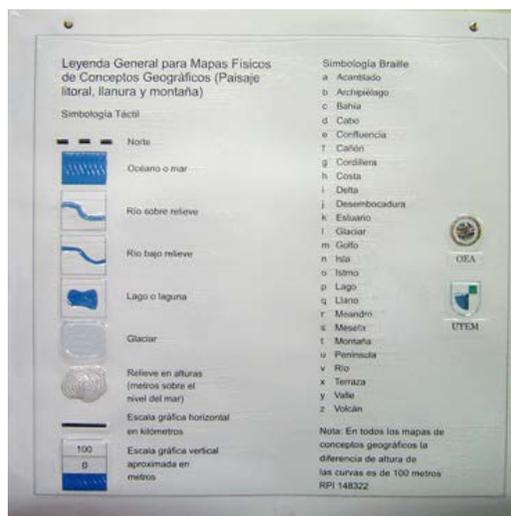


Figure 18.5 shows the legend of a Chilean tactile map.



Figure 18.6 Tactile Physical Map of Chile.

4 Experiences in the world of tactile cartography, from the viewpoint of the producers.

Currently the Tactile Cartography Centre Program – CECAT – is the only one of its kind in Latin America, thanks to the sponsorship by the OAS through the Pan American Institute for Geography and History - PAIGH. This program has developed research and production projects in the sphere of tactile cartography and multi-sensory material since the year 1994. This Centre was officially set up at the UTEM in 2003. Its products are distributed to both organisations in Chile and internationally. Mainly through the Education Ministry, in Chile they are distributed to schools for the blind and centres for social integration where visually disabled people study.

Over the years, researchers from study centres at Universities and schools in Argentina, Brazil and Peru have joined the program. Its main objective is to study and create multi-sensory cartographic products and teaching material. Production is at the level of academic research with small volumes.



Figure 18.7 shows tactile maps in different forms.

5 Conclusions

The process of creating tactile cartographic products is a fundamental tool for the process of understanding spatial reality by the visually handicapped. The work methodologies for making tactile products are processes that are continually validated and adapted in accordance with the aims of the study or matter being faced.

The multidisciplinary research team at a Latin American level that participates in the CECAT has been able to establish the methodological and technical basis for creating tactile cartography for, essentially, blind persons and for those with limited vision. The expertise of each of the researchers in the areas of cartography, geography, special-needs education, design, sociology and other specialisations (depending on the project to perform) has been a decisive factor in the progress made to date.

The studies carried out in Chile, in the area of tactile images has made it teaching material where the use of Braille and sound media provide greater benefits to visually disabled people.

The earliest research, in Chile, into creating and producing tactile models and maps for blind people was developed at the UTEM, where the lead researcher has stated: *"The development of tactile cartography and multi-sensory teaching material to be used by people disabled in the visual aspect, and now also those with*

hearing disability, is of use across any thematic area. This has been demonstrated in the projects performed to date, in which the spatial portrayals of geography involving global warming, natural events and now the tourism dimension have served as models for proposing the standardization of tactile symbology and Braille for Latin America." (A. Coll, 2014).

Tactile cartography will be improved when, in the near future, the standardization of its symbology is put into effect in Latin America. The CECAT team is researching this with the purpose of setting up a single language for the tactile portrayal of geographic space.

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