



# Conceptual basis for creation of national toponymic geographic information system

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## ABSTRACT

The issues related to the geographic information systems and spatial databases play an important role in toponymic research. The interest for this field is due to the expansion of the use of geographic data. This article examines the functions of toponymy, and analyzes the impact of historical events and processes, the change of socio-economic formations on toponymy. It highlights these patterns represented in the Azerbaijani toponyms system. Globalization and Internet technologies have necessitated an access to reliable spatial data. Therefore, the urgent task of regional onomastics is the creation of electronic regional databases, the formation of a single database linking toponymic data from all regions of Azerbaijan. This article substantiates the need for the creation of the National Toponymic Geographic Information System in Azerbaijan.

## 1. Introduction

The contemporary development stage of world science is characterized by the intensive advance of interdisciplinary fields. Elements and research methodologies of different fields of science merge to gain more effective results. Toponymics positions at the intersection of linguistics, geography and history, and is one of such interdisciplinary fields [1]. Toponymics is a branch of onomastics and studies the names of geographical objects, including their origin, development, transformation over time, and their current state. The set of toponyms in each area comprises its toponymy. Toponymy is the objective of toponymics [2].

The functions of this field of science may include enlightenment, pedagogical, the regulation of designation and naming, correct spelling of addresses and geographical names, determination of transformation rules from one language into

another [3]. Toponyms are also of great ideological and historical importance. Because different geographical names represent the rules of language, the past of a particular people, as well as various tribes and ethnic groups involved in its formation, and other socio-political factors. Historical events and processes, such as change of socio-economic formations, occupation facts, etc. have no doubt affected toponyms. This regularity has left indelible traces on the system of toponyms of Azerbaijan.

The inability of some toponyms to preserve their original form, to be replaced by new ones over time, and to undergo a transformation is a gradually ongoing natural process. Displacements of ethnic groups residing in a particular area, the changes in the relief structure of that area, important socio-political events, connection of the name with specific individuals, etc. can lead to certain variations in the toponymic composition. Geographical names are the product of a certain period and certain

formations and represent the events related to the historical, socio-economic, sociological factors of the people inhabiting in a particular territory. This shows that toponyms have emerged at certain historical stages and changed in form and often in content depending on specific historical events, such as population migration, wars, culture, economy and language relations [4].

The Convention Concerning the Protection of the World Cultural and Natural Heritage, adopted by the General Conference of UNESCO in 1972, calls for the non-distortion and non-alteration of historical toponyms [5]. From this point of view, the important and urgent task of our time is to inventory and preserve the names of geographical objects that were widespread in the past and are still exist as a part of the historical and cultural heritage of peoples of any region of the planet.

The use of geographic information systems (GIS) in the study of geographical names was not widespread up to recent years. Presently, GIS and geographical spatial databases have begun to play a major role in toponymic research. The development of advanced information technology (IT) further expands opportunities in this area and identifies new approaches. The main objective of this study work is to identify and analyze modern tools for collection and study of toponyms, and to take advantage of such tools in various types of research [6].

## 2. Relevance of the problem

One of the most famous sayings of the ancient Roman Empire was “Nomen est ommen” (name is the basis). In fact, each name defines the realities associated with the name surrounding it. Natural geographical objects not differing from each other gain the status of space and address only after being named. Therefore, toponyms are very important, strongly informative and sustainable national symbols. They play a significant role in determining the cultural landscape of country and people. As toponyms represent the collective memory, they provide a solid historical material for the study of the socio-cultural past of the territory. A.A. Bakikhanov first studied the toponyms of Azerbaijan and noted: “If the tribes, villages, buildings and ancient artifacts of the country are widely studied, the origin of the population can be determined” [7].

Toponyms preserve both historical and ancient geographical areas, and therefore can be considered a certificate of any geographical object. The

nationality of a newly born baby is determined by the ethnic origin of his/her parents, and similarly, the determination of the land is provided by the people and ethnoses, who named the area. Naming something means to have power, control, authority over it. Consequently, the naming of geographical objects has long been directly related to the national identity and territorial affiliation of people [8].

The process of occupation of specific territories begins, first of all, with the geographical names of that area and it is historical fact. Modifying geographical names is a way to strengthen the dependence in the occupied geographical objects, to vanish the ancient history of the area and to falsify it. Even after the occupation of the territory, the aggression policy against toponyms continues. Toponyms related to the history, language and ethnography of the local people are changed to redefine the geographical area in that territory. Geographical units are given the names belonging to the language of the occupant people, and new objects are also named with foreign toponyms.

All this stems from the intention of the ruling forces in that area to manipulate toponyms to achieve their ideological and political goals. Explaining the basic principles of the studies in this field, Peirce Lewis shows that toponyms determine the human landscape in the area. Toponyms comprise our daily vocabulary, both orally in our current communication, and visually being represented in road signs, addresses, billboards, maps [9].

In this sense, toponyms are a tool to strengthen positions in any area, to shape the socio-cultural landscape of that territory, to penetrate people’s lives and adapt them to existing realities.

Due to the favorable geostrategic position and rich natural resources, Azerbaijan has been repeatedly targeted by various invaders throughout history, and along with our lands, our native geographical names have been invaded by foreigners. Successive change of many toponyms in the country, renaming of our territories with strange names have led to the formation of Arabic, Persian, Mongolian, Russian and Armenian areas in the toponymy of Azerbaijan. This process was intensified, especially following the establishment of the Republic of Armenia in the historical lands of Azerbaijan in the early twentieth century [10].

In recent years, the President of the Republic of Azerbaijan, Mr. Ilham Aliyev, has rightly raised the issue of toponyms in various speeches to expose the lies presented to the world by the occupant Armenia for decades. He draws attention to the fact

that the vast majority of toponyms in the territory of present-day Armenia are of Azerbaijani origin and have massively been changed by Armenians. The maps compiled during Tsarist Russia in the early twentieth century prove the fact that the vast majority of toponyms in present-day Armenia are of Azerbaijani origin.

Taking advantage of the political conditions created in the former USSR, the Armenians mass-Armenianized our national geographical names in these lands and created the basis for the legalization of the occupation of our historical territories. Shortly after the establishment of Soviet power in the South Caucasus, Armenians first changed toponyms in Nagorno-Karabakh (Khankendi was renamed Stepanakert on August 10, 1923) and in the Armenian SSR (Vedi - Ararat (1924), Jalaloghlu - Stepanavan (1924)). Following the relevant decision of the Supreme Soviet of the Armenian SSR dated January 3, 1935, the change of the Azerbaijani toponyms in these lands became more prevalent. Between 1935 and 1976, more than 460 Azerbaijani toponyms in Armenian territory were renamed and armenianized [11].

Although the Armenian leadership justified the change of names by representing their religious content and feudal past, in fact, the real purpose was obvious. Consequently, many Azerbaijani historical monuments in the territory of Armenia have been erased, and preparations for the occupation of Karabakh, an integral part of Azerbaijan, have been realized in the same way. Accordingly, our ancient geographical names, the spiritual treasures of the world culture, were subjected to Armenian vandalism [12].

The same situation is in our historical lands in Georgia as well, our place names are replaced by Georgian toponyms.

The change of Azerbaijani toponyms in the territory of both Armenia and Georgia for a long time can be viewed in the historical, regional-political and political-legal contexts.

Each of these contexts must be taken into account in all implementations to be done by the Azerbaijani state today to solve the problem, and research methods of human geography shall be used.

Due to the advanced Big Data technologies, human geography widely used all over the world studies societies, their characteristics, activities, and social thinking in relation to the geographical environment and national spatial information to which they belong [13].

Building electronic information resources through computer and network technologies

expands the scope of this field of science, increases the sources used. At present, one of the urgent tasks of regional onomastics is to build a single, interconnected and accessible database unifying electronic regional databases and toponymic data of all regions of Azerbaijan.

As noted, the need for reliable and up-to-date information on toponymy has long existed in society, that is the origin of geographical names is of great interest to all people. This issue has been provided to some extent with publications so far, for example, available toponymic dictionaries and popular scientific books. However, they are insufficient and each has been published in small editions. The information needs of modern societies require more accessible data sources.

The creation of geoinformation systems related to toponyms is the most important method of initial development of toponymic materials.

### 3. About Geonomastics

Onomastic units provide strictly encrypted information while determining the relationship between the historical and geographical features of the area and the composition of population, identifying natural and human factors affecting the distribution of settlements by regions, and tracking these effects in modern times. Human geography fully takes advantage of this information. The use of this research method has shaped the science of Geonomastics as a new branch of onomastics.

About 60 years ago, the American geographer John Wright (1891–1969) introduced the term Geonomastics to describe it as the study of the impact of human emotions, motives and behaviors on the history of geography [14].

Furthermore, the French scientist Eugen Schochenmaier defined Geonomastics as a new discipline within onomastics, its relationship with other sub-disciplines, and its difference from toponymy [15].

Thus, if we examine it from a logical point of view, we can approach Geonomastics as a branch of science that systematizes the facts of how special names are formed in certain areas and studies the formation of special names in relation to geography. The main difference from traditional toponymy is that geonomastics determines the trajectory of place and ancestry names, identifies the intersections and separations of peoples and cultures, searches for the areas where these names are spread, traces historical events and processes as the names change and the trends in public

consciousness.

Geonomastics has a lot in common with many fields of science, such as areal onomastics, dialectology, cartography, population genetics, demography, ethnography, historical geography, anthropology, etc. and often refers to research methods applied in these fields. In the environments, where peoples interact, their cultural values, languages and dialects, including the names they give are interconnected.

Name maps or onomastic maps are of special importance in geonomastics. Onomastic maps are the geographical resources representing the spatial distribution of names. Since these maps have special objectives and are designed for a specific audience, the physical characteristics of the area, geographical-relief structure, and other issues are not so important for these maps. They focus on the description of social, cultural, political, economic, agricultural, mental, or any other aspect of the groups of people residing in a particular area, village, city, state, or even the entire continent.

Onomastic maps have three main objectives:

- 1) to provide onomastic information about a particular area;
- 2) to provide information about name parallels and space;
- 3) to compare name parallels between two or more maps.

The purpose of using onomastic maps and their audience is also significant. The geographer may be more interested in onomastic data that accurately describe the boundaries between the areas on a map. Or historian may focus on the historical points on the map. For a linguist, the main point is the linguistic features of the names. Therefore, these points should be taken into account when preparing onomastic maps.

Different methods are used to compile onomastic maps:

- representing the processed statistical and onomastic information, i.e., data on a specific region. This information on onomastic maps is presented for the areas in relevant colors. For example, the color of the region on the map, which has a higher frequency of a certain toponym, name, surname, etc., may appear in a different or slightly darker color. This method is also important in terms of determining the dimensions of the onomastic phenomenon within the same region.

- representing the onomastic data on the map with proportional symbols. These symbols can be proportional to the frequency of a certain name in a particular area, its distribution areas, movement

positions, and so forth.

- marking the onomastic phenomenon existing in the area with dots. In this case, each dot on the map represents a name or a set of names. For example, this method may calculate the distribution coefficient of the same name per 100 people with one point, or a toponym for specific areas.

- correlating the names of the same form on the map, etc.

All this indicates that geonomastics is an extremely useful meta-field for the implementation of various projects in different areas as historical, political-ideological, cultural, multicultural and so on. Big Data analysis of toponyms with the prospects offered by this field of science creates new opportunities for scientific research. Marking the place names on interactive onomastic maps facilitates the identification of their distribution areas, identification of language affiliation, etymology, relations with ethnic communities, and finding parallels in other areas. The changes in toponyms significantly contribute to the visual observation of historical processes.

#### 4. Multidisciplinary approach to toponyms

Many valuable projects have been recently implemented in Azerbaijan to develop interactive maps of toponyms, for example, the portal [www.realmaz.az](http://www.realmaz.az) [16]. It provides an interactive map of toponyms of Azerbaijani origin, their distribution areas in the territory of the present-day Republic of Armenia. The map contains historical information about each toponym. Relevant archive materials, books and historical documents were widely used while collecting the information. The further presentation of this information in different languages can play an important role in conveying the Azerbaijani reality to the world community. As a next step, collection of the names of Azerbaijani places on the same map in the territory of Georgia, Iran, the Autonomous Republic of Dagestan can be implemented in terms of documenting historical processes.

However, such projects are still rather descriptive and do not include the toponymic data analysis methods. Therefore, there is a great need for the development of a platform for the toponymic data analysis and its integration with other multi-disciplinary research fields.

The implementation of multidisciplinary

projects related to toponyms should specifically focus on the real facts non-affected by the ideological influences. It must be acknowledged that for some period of time in the Soviet countries, including Azerbaijan, historiography and other fields of science have served for ideological purposes more. Researchers were more interested in the ideological interpretation and benefits for existing ideology rather than the real facts and realities. Nowadays, the capabilities of IT are expanding and penetrating all areas, and these approaches no longer appropriate. The application of IT leads to the achievement of accurate results in scientific research, which requires referring to only the facts for taking advantages of these results purposefully and effectively in terms of the interests of a country.

With the advanced Big Data technologies, we attempt to explain how the ideological approach to history, including place names, limits our opportunities in terms of information warfare with examples, i.e., in Azerbaijan, almost all the sources, official speeches and mass media show only the Azerbaijani variants of the names when referring to the names of our historical places in the territories of present-day Armenia. For example, they do not specify Stepanakert when they mention Khankendi, Ararat they when mention Vedi, Vardenis when they mention Basarkechar and so forth. If someone uses already Armenianized versions of the Azerbaijani toponyms, it provokes protests being supposed as an ideological mistake.

Moreover, when it comes to the historical lands of Azerbaijan in the territory of present-day Armenia, in most cases, these territories are specified as Western Azerbaijan. Remarkably, the place names to cover all our districts and villages in the western part of Azerbaijan, as well as our lands in Armenia, whose geographical area and boundaries are indefinite, do not refer to Azerbaijani lands in Georgia, as well as western regions within our country.

The toponym of West Azerbaijan, used for ideological purposes, in fact, breaks the historical relationship with our lands in the territory of the present-day Republic of Armenia. For the reason that, no matter how bitter the truth is, we must admit that today our historical lands, which these toponyms refer to, are part of the UN-recognized territory of the Republic of Armenia. The term Western Azerbaijan, which we use unofficially, distorts this reality and does not significantly contribute to our national state interests. However, multidisciplinary approaches to toponyms may

provide greater benefits in this regard.

A clear strategy must be projected that takes into account the realities for restoring our historical rights over those lands and using toponyms as our intangible cultural heritage in this process, and documenting the acts of vandalism against our historical place names for many years. Our strategic goals and the information war we are pursuing, should be aimed at our specific historical territories, the exact boundaries, both past and present of which are known in the territory of present-day Armenia, rather than the indefinite geographical area called Western Azerbaijan. Innovative solutions to toponyms can play an important role in the implementation of this strategy, i.e., the global recognition of their Azerbaijani affiliation in terms of historical, socio-cultural and human geography of those lands.

This problem is not limited to the names of our historical lands in neighboring countries. We can see the same faults in the territory of Azerbaijan as well. There are quite a lot of settlements in the country that have been renamed several times due to certain historical reasons. This process has become widespread, especially in Azerbaijan, as in many former Soviet republics during independence. Many settlements of foreign origin, associated with Soviet ideology, have been given new names. The ancient names of some settlements have been restored, and some places have been renamed with new toponyms. Despite all these shortcomings, the massive violations, the process itself should be highly praised for its contribution to the restoration of historical memory.

The main disadvantage here is that only new names of these settlements are mentioned in all sources. The Azerbaijani part of the Google Maps platform also contains only the new names of such districts and villages. Digital maps do not contain any records about the previous names of these places, indicating the earlier period of history. For example, during the Soviet reign, the Beylagan district was renamed to Zhdanov, Bilasuvar district to Pushkin, Tartar district to Mirbashir, Goranboy district to Gasim Ismayilov, and etc. The maps and other available sources do not show any information about this naming. It extremely hinders the chasing of historical processes through the traces of toponyms, eliminates the interactive connection between different historical periods. Determination of people's geographical affiliation also becomes challenging. It prevents finding their place of birth and exploring the social environment they belong to.

Throughout human history, just as people are recognized by their place of birth, recognizing different places for their personalities has also been experienced. We have quite great personalities born in the lands of Azerbaijan in neighboring countries and played an important role in the history of our public opinion. The fact that these personalities were born in those areas, and representing this fact in electronic resources, directing to specific addresses in neighboring countries when searching for them on the Internet in an interactive map guide, and that the names of our compatriots are grouped around those settlements are the best proof of the Azerbaijani affiliation of those lands. However, unfortunately, the biographies of many of these individuals on the Internet resources, for example, their birth places indicate only the historical name of Azerbaijan in the territory of present-day Armenia. No information about the current name of the settlement is mentioned. This gradually lead to forgetting the policy of ethnic cleansing pursued by Armenians against Azerbaijanis.

For example, let's view the first sentences of the biography of prominent surgeon, academician Mustafa bey Topchubashov in Wikipedia, who was born in the territory of present-day Armenia and became famous in many countries as being educated in the rich scientific environment created by our people in those historical lands for centuries: Mustafa Topchubashov was born in 1895 in the village of Goykumbat in Western Azerbaijan (present-day Republic of Armenia). Academician Mustafa bey Topchubashov was a representative of one of the prominent descendants of ancient Irevan. The village of Goykumbat, where he was born on August 17, 1895, was the lands of the Topchubashovs [17].

The name of Goykumbat village, where Mustafa bey Topchubashov was born, was changed to Geghanist by the decree of the Presidium of the Supreme Soviet of the Armenian SSR dated December 1, 1949. However, it is not specified in the biography of Mustafa bey Topchubashov. The ancient name for the village is Goykumbat. Thus, it is impossible to determine which settlement in the territory of present-day Armenia this village refers to. Moreover, a boundless opportunity to establish historical connections between individuals and places, i.e., to view the historical landscape on interactive maps for all periods is restricted.

## 5. The need for creating a National Toponymic Geoinformation System

The 25th International Congress of Onomastics (ICOS2014) (Glasgow) held on August 25-29, 2014 raised the problem of introducing advanced technologies in onomastic research and promoting the results of scientific research [18]. Peder Gammeltoft, professor at the University of Copenhagen, particularly focuses on this issue in his report on the transition of onomastics to a new stage of digital development. Author believes that to make onomastics more popular science, scientists "must disseminate the results of their research through various Internet portals and mobile applications" [19].

Establishing such an information source on the Azerbaijani toponymy and making it accessible to everyone by posting it on the Internet would further increase the interest in this field in our society and would be of great benefit in achieving national strategic goals. In case of establishing this source, each user will be able to acquire detailed information about the geographical names by referring to the toponymic database.

The establishment of the National Toponymic Geoinformation System (NTGS) is essential for a purposeful approach to above issues. NTGS will refer to a Toponymic Registry, which will ensure the safe storage of all Azerbaijani toponyms in a single online environment being accessible to everyone. Toponymic Registry will comprise interactive maps of toponyms and a fund of toponymic dictionaries, and a toponymic database.

Once NTGS is formed, it is necessary to implement a project to upload biographies of a large number of people in different languages in the open online encyclopedia Wikipedia and other relevant resources. Uploading the biographies of each Azerbaijani personality born in the historical lands of other neighboring countries, including present-day Armenia, on the Internet should be ensured. All variations of the settlements' names where they were born, the date of change of previous and present names, as well as the origin of the toponym must be represented in these biographies. In this case, the new names given to those territories will be the equivalent for the previous historical names, and the historical realities will undeniably be revealed once again.

Initially, the biographies of prominent people born in those lands have to be systemized. Following this, it will be clear in the Internet search

engines that a large number of Azerbaijanis massively lived in these areas until certain dates, and that these lands belonged to Azerbaijanis. Vandalism and moral genocide against Azerbaijani toponyms will be confirmed once again. Our names, which are attempted to be erased from the history, will gain eternal life, and historical inheritance will be ensured between generations.

A special online platform in different languages should be created for Azerbaijanis around the world to compile their biographies based on certain standards, to create conditions for each of our compatriots to contribute to the information war in the field of toponyms with personal biographical information. Both current and previous versions of place names included by individuals in their biographies, as well as the dates of those changes should be provided.

The results obtained from multidimensional analysis, emerging trends, tracking historical trends will be represented on interactive onomastic maps with specific colors.

Overall, the formation of such a system will significantly support research on human geography, historical research, and will create ample opportunities for improving analytical activities related to toponyms.

## **6. BillionGraves.com platform opportunities**

Widespread informatization, development of high-speed Internet, mass use of laptops, mobile devices, increase of digital literacy of the population cover most countries of the world. This is represented in qualitatively new approaches to the study of toponymic vocabulary. Innovations in digital mapping and mobile applications enable ordinary citizens to contribute to the online processing of toponymic materials. The emergence of information retrieval services such as Google Maps, Apple Maps, Yandex.Maps, Bing Maps, etc. opens up new horizons for toponymic research [6].

The global BillionGraves platform is one of important tools used to protect the material and spiritual heritage of people, to shape a historical landscape of different territories with the application of toponymic Big Data technologies. It is an open online resource that brings together data on cemeteries and tombs around the world. Volunteers from all over the world take photos of graves, determine their exact location via GPS technology and upload them to BillionGraves.com

together with the available information about the person to whom the grave belongs [20].

Like other global platforms, this portal is available in various first-class domains. A mobile application of the BillionGraves platform has also been developed to simplify the working process. Simultaneously, this system is integrated with other local and global electronic resources collecting information about families and genealogies. Any Internet user from any corner of the world can access the information in this system.

This is an unprecedented opportunity to get information about our compatriots who died within and beyond the territory of Azerbaijan. Moreover, this platform is a very effective tool for documenting the facts about our historical lands annexed to other neighboring countries, determining the affiliation of population of different territories, tracking migration, and conducting historical research in various fields.

Note that, like other material and cultural monuments of the past, the grave names also refer to toponyms. Cemeteries contain valuable onomastic material. These materials must be collected and clarified. Furthermore, the work of epigraphers reading inscriptions on gravestones may contribute to onomastics much [21].

Unfortunately, we have not been able to take advantage of this opportunity yet. Thus, when searching on the BillionGraves platform, information about the graves of only 18 people from Azerbaijan is available yet.

There is a great need to promote this platform in our country, especially with the involvement of young volunteers with IT skills. The inclusion of information about the graves of our compatriots buried in our2 ancient lands in the territories of present-day Armenia in this system and its integration with NTGS, the creation of their virtual graves in BillionGraves will provide eternal life of those people; will provide an overview of the historical areas inhabited by the Azerbaijani people; will form a reliable base of historical evidence that these territories belonged to our people; will provide rich material for research in various fields of science; all together, it will restore historical ties between generations and serve to protect national and spiritual memory.

## **7. Conclusion**

The state-of-the-art in the field of toponymy in Azerbaijan, the protection of geographical names by the government, the expansion of information and

communication technologies and their penetration into all areas, on the other hand, the global devotion to this area, the creation of information and retrieval engines and geoinformation systems reveals the development prospects of toponymic research.

Based on the research we can conclude that:

— The inability of some toponyms to retain their original form, being replaced by new ones over time, changes in form through transformation is a regular process.

— Due to its favorable geostrategic position and rich natural resources, Azerbaijan has repeatedly been the target of various invaders throughout history, and along with our land, our native geographical names have been invaded by foreigners. Successive change of many toponyms in the country, giving foreign names to our geographical areas has led to the formation of Arabic, Persian, Mongolian, Russian, Armenian areas in the toponymy of Azerbaijan.

— One of the most important and urgent tasks of our time is the inventory and preservation of geographical names containing rich information as a fragment of the historical and cultural heritage of the peoples of any region of the planet.

— With advanced IT, toponymic research has acquired a new shape, characterized by the latest approaches to the collection and processing of geo data.

— Building a modern information system on toponymy of Azerbaijan accessible for everyone, creating an opportunity for users to obtain information about geographical names by referring to the toponymic database, conducting analysis for various purposes are inevitable.

All this necessitates conducting urgent research on the establishment of NTGS.

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