Description of a Pilot Digital Interactive Tool of Territorial Resource' Spatial Projection and Management

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Abstract. A resource as a virtual structure that is directly connected to the space (territorial resource) is synthesized as a multitude of items – ingredients of material or immaterial dimension. The material ingredients have a tangible substance, such a permanent element of nature or a human construction, such as landscape, water, monuments, paths, etc., while the immaterial ingredients deal with any intangible notion such as heritage, sustainability, prosperity, historical event, social relationships, etc. The properties of both material and immaterial ingredients connection of a resource are dramatically important to describe and highlight a territorial resource. This connection should be associated with a spatial projection/visualization allowing actors (decision makers, training local policy, citizens, etc.) who are involved in a process of construction territorial resources to better understand the space and to consult in a more fertile manner in a participatory territorial resource's management process. The research deals with the theoretical description of a digital tool of territorial resources' representation and management that will combine modern simulation technologies and will investigate the search of a functional relationship between virtual environment, territorial resource' elements and local actors' institutional learning cognitive needs, leading in this way, to enhanced sustainable management of territorial resources. Finally, the proposed tool should help the process of identifying and highlighting the territorial resource, the active participation of local actors and the collective local memory in order to project in space the connection of the material/immaterial elements of the territorial resource.

Keywords: Territorial resource's representation · Spatial territorial simulation tool · Territorial resource's management · Consumer's participation · Social learning

1 Introduction

In recent years, in a globalized environment, many regions seeking competitiveness through distinctiveness [1] and benefiting from the shift of consumers towards quality and authenticity, invest in them. All these dynamics lead to the transition from raw

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material to territorial resource (TR) signaling a significant change in the relationship of the produced good or service with the place of origin. The TR, in contrast to the raw material, results from a series of material and immaterial elements anchored in a place [2, 3]. The material (tangible) elements are linked, specifically to agri-food and local alternative tourism, to the soil, plant varieties, animal breeds, processing and packaging materials, etc. The immaterial (intangible) elements refer to heritage [4, 5], practices, knowledge and know-how, in what defines the relationship of local culture with the reproduction and exploitation of the resource.

It becomes obvious that the effort to highlight the uniqueness of the resource and the final product encounters difficulties when is going to project the connection of the material with the immaterial nature of the constituent elements of the resource. For example, if anchoring in space and place is easy to demonstrate (surface, building, cultivation, etc.), the integration of living heritage and local culture is more difficult as it refers to knowledge and know-how that is often informal. International literature supports the view that ultimately the resource does not exist but is constructed by local actors cleverly incorporating heritage through a combination of elements and is therefore virtual [23].

Therefore, both the difficulty of visualizing the connection of the material and immaterial dimension of the resource and the fact that the target group is consumers, argue for the need to support the identification process with special claim guarantee tools.

These tools use new visualization technologies and are part of Participatory Guarantee Systems (PGS) in which local and non-local actors, public services, etc. are activated [6–8]. These systems are usually aimed at uninformed consumers but are also used by local actors to coordinate the management of the resource. In both cases, these systems work in a framework and a learning process for local actors (control and strengthening of guarantee instruments) and consumers (understanding the nature of the elements and the importance of their interconnections within the resource). Finally, active participation in a PGS creates trust, transparency, reciprocity between producers, products and consumers [9–11] while facilitating consumer knowledge [21].

The concept of virtualization is not an abstract notion but it attempts to connect the tangible and intangible dimension of the resource and therefore the liaison of the imprints in the space (territory, monuments, artisanal workshops, landscapes) with the accumulation of an intangible heritage (history, know how, natural resources management practices, etc.). That due to its contact with local economy acquires a new status and a new function in the production process that is proposed by a group of local actors. The introduction of inheritance and anchorage define the territorialization procedure that should be based in a parallel institutional learning process of the actors of these areas aiming at forming new forms of cooperation and ‘governance’.

Therefore, new methods and tools should combine the spatial and territorial dimension with the virtual (intangible) nature of the resources and also contribute to the identification and attribution of new properties and uses in these resources. A TR’ management system, should, inter-alia:

(1) represent the area that the resources and the actors refer to,
(2) integrate local actors and support them by facilitating observation and identification,

(3) contribute to the interconnection of tangible and intangible ingredients of the resource by elaborating and evaluating any information compatible with the market,
(4) facilitate the distribution of roles within cooperation and coordination forms and draw an action plan for the promotion and utilization of these resources.

The consolidation of a future procedure-methodology for the management or even the construction of TR with the necessary spatial projection of the relations "tangible-intangible" and the correlations of the ingredients of a territorial resource requires, among others, the creation of a digital interactive tool that will be able to simulate spatial entities and enable both their recording and their structure as well as their enrichment by participants.

2 Project Framework

This research work is being proposed on the occasion of 'Terra Thessalia' PGS project, that has been published previously by the same authors [21]. 'Terra Thessalia' cluster was created in 2016 in the framework of Lactimed European program [2012–2015] [34] and aims to strength the production and distribution of innovative dairy products in the Mediterranean and proposes a PGS managed by a territorial administration via an organization of local industries [35]. 'Terra Thessalia' PGS's objectives are, inter alia, to:

(1) enhance more territorialized specifications
(2) highlights the quality and the identity of the final diary product of Feta cheese
(3) integrate Feta cheese to the pastoral resource
(4) brings to the surface the question of the transmission of the qualitative and identity characteristics of the territorial product
(5) create an alternative system of guarantee - certification – traceability
(6) enhance small-scale productions and the local economy
(7) encourage the participation of consumers by sharing knowledge, experiences with producer groups [28, 36], based on the principles of participation, reciprocity, transparency and trust [9–11].

Along with the creation and development all guarantee - certification – traceability processes of 'Terra Thessalia' PGS, a pilot interactive visualization tool of PGS tool was developed. This tool visualizes spatially all the PGS mechanisms from the production process of a diary product, including the whole traceability process, the attachment ('anchorage') of the local product with the unique territory (territorialization) and TR's aspects, until the consumer's participation and the final specific guarantee nature product (guarantee certification of a process, animal feed, animal milk quality, remote monitoring GPS information of animal path and location, etc.) [21].

This work, as it focuses on the management and spatial projection of TRs and their intangibles / tangibles ingredients correlation in order to contribute and facilitate the description of a future platform of TR's construction with consumer's participation, has a complementary research approach to the PGS pilot visualization tool.

The proposed visualization tool description is based on an interactive methodology [5] on TRs construction mechanism and procedure allowing the guarantee of the

resource's bonds with space (spatial bonds, social, cultural, economic, etc.). The above methodology refers mainly to the identification, registration and correlation analysis of the tangible-intangible ingredients as a TR construction tool for local stakeholders; one of the main characteristic and further objective of the above methodology should be the detection/development of a mechanism process allowing its adaptation to the corresponding process of spatial projection and visualization tool by correlating the corresponding process / methodology steps.

Thus, the description and the enhancement of a TRs management tool via spatial simulation remains absolutely necessary, irreplaceable and integral part of a holistic TRs management and construction tool, as it should facilitate and contribute drastically to an institutional learning of the territories' actors (decision makers, producers, consumers, etc.).

3 Territorial Resources Aspects

3.1 Territorial Resource's Notion

The territorial approach of the rural area's development focuses on the economic dimension of the construction and emergence of territories and territorial resources. The Territorial Resource is a territorial development model based on a self-organizing movement aiming to:

(1) attach (anchor) a resource (agrifood product, historical event, monument, etc.) to the local territory by introducing a relevant inheritance,
(2) search competitiveness through the distinctiveness and the specific character of the manufactured resources and not through the reduction of the production cost,
(3) favorize a positive external environment created by decentralization,
(4) enhance public motivation policies
(5) create new expectations and institutional learning process of an increasing part of the consumers by forming new cooperation models

Thus, the operational objective that this issue tends to form is based on the territorial dimension that the local resource / product is now assuming due to the bonds with its production area and the incorporation of heritage [4].

3.2 Tangible and Intangible Ingredients

The component's unit of a TR is in essence the element that make up the central 'link' of the whole chain (eg. Agri-food chain). Each 'link' consists of its own corresponding.

units of TRs components. Every TRs 'link' refer to a production chain, structure and process (production unit). Every production unit consists of main components or sub-components associated with intangibles/tangibles ingredients that characterize and enhance it.

For example, in the case of 'Terra Thessalia' PGS the main 'links' of agri-food chain are 'Geo-Production Unit' and 'Artisanship unit' which in their turn consist of main components (such as 'Livestock', 'Grazing Feedstuffs', 'Space Milk', 'Collection Product',

etc. Each component, eg. 'Livestock' consist of sub-components such as 'Herd', 'Corral', 'Animal breed' etc. Every sub-component is associated with intangibles/tangibles ingredients. On one hand, the tangibles ingredients have to do with any element that has a tangible substance, is a permanent element of nature, such as landscape, water, flora, microclimate, etc. or even a tangible human construction, such as buildings, paths, bridges, monuments, etc. On the other hand, the intangibles ingredients have to do with any immaterial element or a notion such as heritage, sustainability, prosperity, historical event, social relationships, etc.

The intangibles ingredients can be supported, completed or mainly fall into a central category of intangibles "Principles and Values", such as "Legacy", "Proximity", "Quality", "Solidarity" and "Tradition" etc.

The spatial projection (simulation) and management of TRs components are based mainly on some correlations assuming some main criteria. Any inter-correlation between TRs unit, component assuming a tangible or intangible ingredient can be a key feature of TR spatial projection in the visualization component of the proposed tool and a search item in the management component of the same tool. The proposed TRs visualization and management tool have to be adapted to a given methodology of a TRs construction tool where all conditions, criteria, components and their correlations are identified. So, the main conditions, criteria under which the tool can operate, are:

(1) Both intangibles/tangibles' ingredients should be anchored in space
(2) Incorporation of main components in TRs units
(3) Decomposition of main TRs components in tangibles/intangibles ingredients
(4) Create correlations between TRs components and their ingredients
(5) Create intercorrelations between tangibles/intangibles ingredients
(6) Linking/completion of intangibles ingredients with 'Principles and Values'.

4 Related Systems – Discussions

Territorial Management (TM) is a mode of governance considering actions on social cohesion, economic strategies, environmental protection and their feasibility for the development of an area [12] and is also a mode of public management of these actions [13].

A plethora of territorial management and local development tools aim to encourage the economic and social growth of the territory while considering its specificities and resources, in order to create a development process engaging all local stakeholders [12].

Many 3D spatial representations systems allow the dynamic territorial management simulation with social features [14], while other systems, such as Dynamic Spatial Simulation (DSS) and Participatory System Dynamics modeling (PSD) integrate programming solutions [15] and computer models to simulate territorial changes [16] and to integrate stakeholders into a deliberation process [14].

According to the international literature, rarely, TR's digital spatial simulation tools project TR's ingredients and elements and their interconnection into a given space so that stockholders can perceive the spatial dimension of all ingredients [17] while others project a general territorial space with diverse simulation techniques, such as agent-based modeling, cellular automata, GIS, spatial statistics, real-time remote spatial simulation,

etc., allowing researchers and stakeholders to evaluate policy, impact assessment and undertake scenario analysis [18]. Other user-friendly digital tools and visualization methods [19] simulate elements and forms' entries in the space by creating anchors to space and the identity of TR's characteristics [20].

All these spatial simulations tools project the TR's elements into a space or even their interconnection between them based on diverse simulation techniques while they do not focus on the spatial representation and management of TR. This work, highlights the need to describe and design an interactive tool for the spatial simulation and management of TR facilitating in this way the integration, awareness and collaboration of diverse stakeholders into a participative process.

5 Objectives and State of the Art

This research promotes "bottom-up" participation of local actors in a participatory procedure of territorial development, supporting democratic planning and combining at the same time interactive simulation, social research and IT tools with territorial development approaches. This work focuses on digital tool definition that combines simulation of visual spatial information and supports multi-partner procedures and participatory planning of TR. It also promotes a functional connection, correlation and projection of the relationship between tangible and intangible elements functioning as ingredients of a TR in the space.

The final purpose of the research is for the simulation procedure to function not only as an information and visualization tool of the TR's ingredients but also to constitute a tool a) that allows to the consumer-user the interactive enrichment of its needs (information retrieval, online consultation-forum) and their correlation with the relevant spatio-productive sections and the resources contents promoting a social learning and b) visualization that allows constant awareness, education and territorial correlation of development procedures.

The coexistence in an online platform of a multi-environment's complete spatial simulation with correlation and registration of TR's ingredients in a database constitutes an innovative territorial resource's management approach. The spatial projection of the TR's tangible and intangible ingredients as innovative approach can create new uses, properties and development actions to integrate new production systems aiming at the creation of new specific products. The proposed digital tool can contribute in an institutional social learning and participation procedure on TR's management.

Finally, an important contribution field is related to the formation of new cooperation and coordination forms (governance). An operational implementation of the proposed tool could structure and contribute to an optimal development actions governance model.

6 Digital Tool Description of Territorial Resources' Spatial Projection and Management

6.1 Introduction

The definition of a TR' spatial representation and management tool presuppose an identification, a structure and a final spatial projection of the main ingredient's units of the TR's links which are in essence the elements that make up the main links of the

TR' structure. A similar structure of TR' identification can be found in Participatory Guarantee Systems (PGS) visualization where every TR's ingredient is associated with tangible and intangible elements that characterize it [21]. The tangible as well as the intangible elements are correlated ("anchored") in the space, both to each other and to corresponding elements of other ingredients.

Each element as a key feature of identifying and searching a territorial resource, corresponds to a series of multimedia messages (representative images, maps, appropriate descriptions, etc.) which refer to the TR's structure. All these multimedia messages contribute to the simulation of a TR's representation/management tool so that consumers, in their turn contribute to the ongoing feedback and adjustment of TR's structure itself. The correlation of all TR's ingredients usually is based on their relationship in the field, the ability for visualization, the involvement of intangible elements into TR and the ability to attribute new elements' properties [21].

The selection and the visualization of TR's ingredients will contribute to the knowledge and ability of the consumers to recognize the value of the ingredients' correlation and facilitate the consumer integration [22].

6.2 Consumers'/Stakeholders' Participation

The consolidation of a procedure for the TR's management with the necessary spatial projection of the relations "tangible-intangible" and the correlations of the ingredients of a TR requires an active participation of consumers and other stakeholders in all phases of the TR's simulation and management. Researches showed limited awareness and knowledge of consumers on practices connecting TR's ingredients such as production processes and quality attributes [22]. PGS are facilitated by interactive visualized knowledge [23] of tangible and intangible TR's ingredients raise awareness while helping and sharing know-how and good practices [22]. This consumer's integration (1) prepares their future "physical" and/or "virtual" engagement in a bottom-up collaboration for the ongoing negotiation of trust and social control built [22] and (2) supports the importance of social learning and education in establishing trust in certification and guarantee process [24, 25].

The interpretation of the correlation among tangible and intangible features of the TR has a significant effect on consumer perception regarding quality and comprehension of virtual representations by specific digital spatial tools [26]. This increases awareness of the TR's management tool and highlights its benefits while the visualization contributes to the social learning process making more understandable to consumers the complex tangible and intangible relations between local resources, consumers and stakeholders [22].

6.3 Theoretical Approach

The spatial simulation of territorial areas for the purpose of their social and economic development is often found in decision support systems (DSS) while they include, among others, statistical models, forecasting, database storage, etc., as well as the results of digital spatial representation tools [27]. Other systems for forecasting socio-economic

development of territorial areas use and apply dynamic spatial simulation models [28] and highly sophisticated "Agent-based modeling" and simulation systems [29].

The description of the proposed pilot digital tool is not a classic case of a decision support system since it aims to activate the participation of local actors in the management of a territorial resource [1, 3]. Thus, it places great importance on the creation of a comprehensive digital spatial simulation and interactive environment, while at the same time the creation of a database would be particularly supportive of descriptions and deliberations around the central core of spatial simulation.

The proposed tool is based on the connection and correlation of the tangible and intangible ingredients of a TR as well as the spatial projection and simulation of all these elements and correlations in space [21].

The correlation and spatial projection of the TR's links with the space creates "anchors" with spatial references which then give new uses to the TR's ingredients and allow corresponding actions to be defined by respective participants with specific roles in order to integrate them into productive systems (e.g. Creative Tourism, Agrifood production, etc.) and to create innovative idiosyncratic local products and services (see Fig. 1).

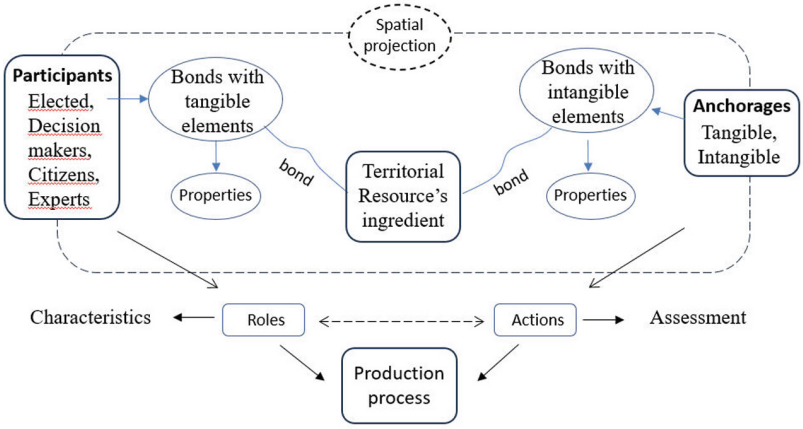

Fig. 1. Schematic representation of spatial projection of Territorial Resource's ingredients management.

6.4 Technical Approach

First, the tool should allow users to be aware of issues of TR's management by presenting either schematically or interactively the respective methodology by operating in an online environment that allows multimedia and interactive representation.

The pilot digital tool should then facilitate and contribute to the participatory deliberation processes of all involved stakeholders. Thus, each participant must be able to consult around a platform, enabling:

(1) a spatial representation of TR's ingredients contributing to the common spatial perception and creating a "common language" of communication, in combination with
(2) the possibility of enriching the TR's ingredients simulation with comments, judgments, descriptions, deliberation results from the participants and of course recording and connecting all of them to an ergonomic database.

To achieve this, the environment of the proposed digital tool, first should allow, among others:

(1) complete and in some cases dynamic simulation of digital background with geographic reference, image and video management (scaling, interaction, deletion, etc),
(2) representation of interactive multimedia applications,
(3) embedding of web spatial multimedia simulation results (GIS background, DTM, 3D models, VR, Virtual tour, Real-time spatial navigation, etc.) as well as the possibility of online hyperlinks of all multimedia elements [30]. At the same time, all simulation data should be able to be structured and linked together in a descriptive and graphical database. It is obvious that the techniques and procedures of 3D modeling and simulation of spatial entities are multiple and will be implemented outside the tool environment using appropriate software and embedded techniques.

The possibility of spatial highlighting and projection of the TR's ingredients links via tangible/intangible elements connection should allow the creation of an environment of institutional learning of the participants [22]. Thus, the proposed tool should use spatial digital simulation techniques and tools to make decisions and manage complex relationships allowing easier understanding of issues and provide the basis for learning conversations [31].

At the same time, the ability to connect each graphical element (spatial view) with a descriptive element, should be recorded in a database. This will allow the retrieval of any type of data (descriptive, graphical, multimedia) based on "smart" queries. Nevertheless, it should be noted that today at the global level the assembly process of graphic and descriptive data involves many problems related to both interactivity and time consumption [32]. Nevertheless, the better use, adaptation and visualization of interdisciplinary spatial data are required as they are directly related to the better presentation of the simulated models as well as the ergonomic operation by the end users [33]. Therefore, the proposed tool tends to put more emphasis on the ability of the environment to integrate digital spatial simulations that will be implemented in suitable external software, rather than on the ability to create an intelligent database that interactively relates graphical and descriptive data.

Finally, the pilot tool should allow the structure of all TR's ingredients in such a way that interconnected and interdependent linked data groups can be created. These data groups should allow:

(1) the creation of new uses of the TR's ingredients and their inclusion in production processes,
(2) a governance model creation of development actions with assessment possibility. To implement this, the proposed online platform should be based on an intelligent and

flexible database (SQL data base) allowing both the data composition into groups as well as the decomposition of data groups into data ingredients by the users themselves (see Fig. 2).

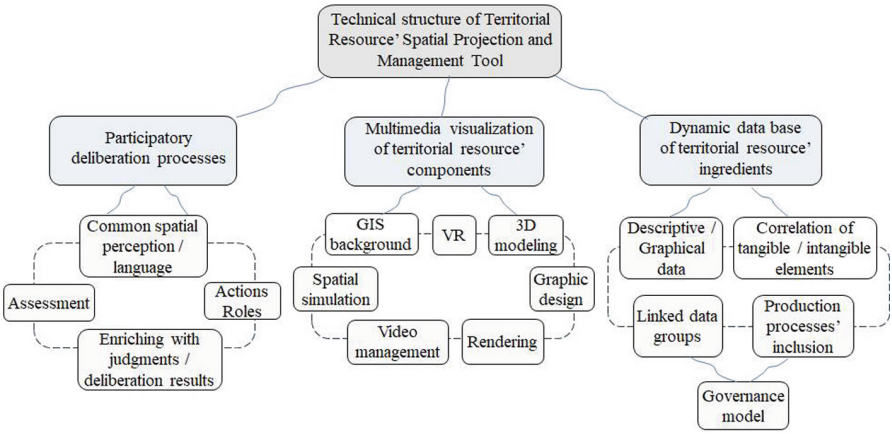

Fig. 2. Technical schematic structure of territorial resource' spatial projection and management Tool.

6.5 Tool's Architecture and Requirements

The proposed tool should be implemented through the creation of a digital online combinatorial platform (e.g. open-source technology) allowing simultaneously 3 main interconnected features' management, such as Multimedia visualization of TRs ingredients, a dynamic online TRs database and finally an online consumer's participatory deliberation forum.

This web environment could be supported by a web server, such as apache 2.4 with mode rewrite and PHP 7.4 with extensions enabled hosts SQL server, JAVA and HTML applications.

Regarding to visualization environment, the web platform (as the above web open-source technology supports), should at least allow the implementation of

(1) 360° virtual tour plugins
(2) 360° video plugins,
(3) multimedia interactive applications in HTML5 and JavaScript,
(4) GPS tracking web technology with corresponding real-time geolocation sharing plugins via web browser allowing instantly view historical tracks and statistics, get notifications and alerts via remotely control devices.

Regarding to the online dynamic TRs database, the above proposed web platform should at least allow the implementation of

(1) Data tables plugins for jQuery supporting any database table size

(2) Form builder creating data apps for back-end and front-end
(3) Query Builder to write SQL queries,
(4) Remote database access to server typers (e.g. MariaDB, MySQL, SQL Server, PostgreSQL, Oracle, MS Access, etc.)
(5) Auto sync CSV, Google Sheets, JSON and XML files, and
(6) Master-detail pages, lookups, inline editing, advanced search features and dynamic hyperlinks connected to the visualized multimedia ingredients.

Regarding to the online consumer's participatory deliberation forum, the above proposed web platform should at least allow the implementation of

(1) Advanced forum user profile system
(2) Live user notification system,
(3) Multi-board and multi-language, allowing separate forum pages and languages,
(4) Forum Access sets (per user / user group / forum)
(5) Multiple search engine (topic, post, tag, etc.)
(6) Social Network Share
(7) Rating and Badges

All interconnected features should interoperate so that every database query's result is linked to the corresponding spatial projected multimedia tangible/intangible ingredient and all its information. The database query should be attempted either through a TRs components structure chart layout or through a unique random search into a classical search field.

7 Conclusions

A description/definition of a digital tool of TR's ingredients representation and management is essential to the territorial diagnosis as it should allow to consolidate a spatial interconnection of TR's ingredients with the territory by the use of modern spatial simulation technology. All data elements will be registered into a descriptive and graphical embedded data base facilitating communication between experts and non-experts' stakeholders.

The theoretical description of the proposed tool facilitates the integration of consumers/users/stakeholder in a common deliberation platform by identifying cooperation and coordination roles and defining action plans for decisions makers.

The impact of such a digital tool should contribute to (1) a better understanding by the local actors of the necessary procedures for the valorization of local resources, (2) the successful completion of actions to increase the value of the goods and services produced and (3) ensure high competitiveness based on the uniqueness of the resources (products).

Finally, the implementation of a TR's representation and management tool which in the future could be transformed as a TR's construction tool should facilitate a more effective application of scientific and research knowledge in sectors and fields that directly concern the dynamic groups of actors and local rural communities by creating convenient conditions for the meeting of traditional knowledge with new scientific knowledge and contributing to enhanced supply of ecosystem services and sustainable management of territorial resources.

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