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## 8 Development of the Urban Planning Cadastre in Russia

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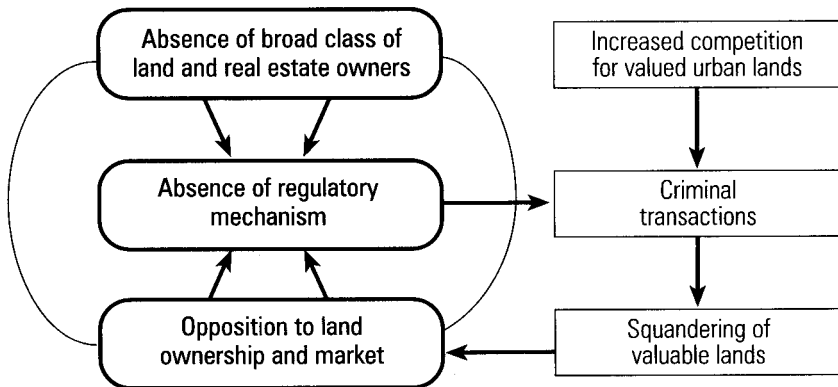
### 8.1 Urban and Regional Management in Distress

The system of urban and regional planning and management in Russia is experiencing a deep crisis (Razumov 1996). The reasons for the crisis relate to the general economic decline in the country over the last several years, the technological backwardness of the managerial infrastructure at local level, and the incompatibility of the 'Soviet' mentality of a large group of political and managerial elite to the new tasks of the transition period. The crisis of spatial planning and management has many manifestations. Before *perestroika*, spatial development was, to a large extent, regulated by a hierarchical system of urban planning documents, from the General Settlement Scheme at the national level to projects detailing plans for administrative districts at the local level. These documents, developed within the system by the State Committee on Construction and Architecture for the entire area of the country, were enforced through the local architecture and urban planning agencies of the Government. With land ownership and managerial rights belonging to a sole entity, the Soviet state, the planning documents represented prescriptive allocations of land and other resources computed as normative multipliers of the projected population. Common errors in such projections (Lappo 1978, Medvedkova 1990) and the relative weakness of spatial management, compared to planning and management by branches of industry, left mostly declarative, ideological functions to the former.

With the introduction of private land ownership and the breakdown of the old enforcement mechanisms, the established urban planning system has turned out to be completely inadequate. Land developers no longer recognize specific stipulations of master plans adopted earlier. Although most of the old master plans need serious modification, federal authorities do not have funds to continue their development and have lost interest in them as an ideological tool. Local administrations, also experiencing financial crisis, typically do not yet understand how they could benefit

from urban and regional planning in the new conditions, and often view it as an unnecessary constraint on free market development.

The separation of legal and managerial aspects of land ownership and the emerging real estate and land markets lead to increased competition for high-valued urban lands among potential land owners and authorities at various hierarchical levels. This competition is hardly regulated. In the absence of an efficient mechanism for land use regulation, legal clarification and implementation of the constitutional right for private land ownership is opposed by numerous groups of the population. At the same time, the creation of such a mechanism is hampered by the absence of a broad class of land and real estate owners, which completes the vicious cycle (Fig. 8.1). Until this cycle is broken, the competition for ownership and management of land happens 'behind the scenes', often in the criminal sphere.



**Fig. 8.1.** The 'vicious cycle' of land and real estate market

This competition happens not only between private land owners and administrations of various hierarchical levels (federal, regional, and local), but also within the administrations' branches responsible for land records and tenure, surveying, physical planning, tax assessment, and environment protection, which struggle for influence in the land market. As a result, many lands with high historical, ecological, recreational or other value are being squandered. Ultimately, the interests of citizens, small enterprises of social infrastructure, health care, education, and business, fall victim to large monopolies and to the 'new Russians' with large financial resources and connections with bureaucracy.

In this chapter, we focus on the development of a new cadastral system that is being developed in Russia (Section 8.2) which is being piloted at various selected sites. The hierarchical organization of land use regulations at federal, regional and local levels and the relationships between the different tiers of land administration are outlined in Section 8.3 which also includes a discussion of the purpose and nature

of different types of land use zoning. According to the proposed system, all land and real estate owners will receive so called 'cadastral passports' and these documents, together with cadastral services provided at different administrative levels, are considered in Section 8.4. Thereafter, the implementation of the cadastral system and its computerisation using GIS technology are reviewed in Section 8.5 with some speculations about the expected outcomes contained in the final section.

## 8.2 The New Approach to Land Use Regulations

The potential catastrophic consequences of continued lawless and irrational land allocation necessitate the development of a legal mechanism for balancing the varying interests of land owners and for organizing space rationally. The concept described in this chapter envisions the creation of a new comprehensive system of urban planning and management, based on certified legal descriptions of urban land use and zoning. The State Urban Planning Cadastre (UPC) of the Russian Federation (RF) is a key element of this unified regulatory system which includes adoption of special urban planning legislation by the federal and regional levels of management, and development of modern zoning methodology and ordinances. The primary goal of the Cadastre is to register and control for specific urban planning regulations as related to real estate, environmental protection, utilities and infrastructure, thus building a legal and technological foundation for the enforcement of land use regulations by all owners. It is believed that the official certification and registration of the regulations in respective cadastral documents, and their use in controlling the deviations from the range of recommended uses, will improve land use practices in the country as a whole and help to avoid ecological and economic losses, as well as conflicts between land owners.

The process of creating the UPC in Russia is already under way, from both the top down, based on the decisions of several branches of federal administration, and from the bottom up, following the initiative of local administrations in several regions and cities. Moreover, at the official meeting of representatives of construction ministries from the CIS countries (Alma-Ata, summer 1996), it was decided that Russian experience in UPC development should be disseminated to the other countries as well, because they not only shared important features of the economic situation, but also had a commonly established normative base of urban planning and school of planners.

The concept of the UPC is rooted in western (European and American) experience of land use regulation, land records systems and zoning ordinances, whilst building on Russian traditions and the specifics of the Russian scene. The main principle borrowed from western models is the protection of the right of land owners to make decisions regarding their land and real estate property, restricted by legally certified

cadastral regulations only, which would limit any other potential bureaucratic intervention. This approach will promote equitable treatment of land owners by providing them with standardized area descriptions and land use regulations. The most important differences, as compared to western examples, relate to: the exhaustive coverage of all regions and urban settlements in the country by a unified system of urban planning regulations, irrespective of ownership (state, private or collective) or the rank of managing authorities (federal, regional, local); the fact that these regulations derive largely from master plans of cities and projects of regional planning; and the development of a special cadastral service on the basis of the existing broad network of architectural, construction, land, environmental and fiscal inspections.

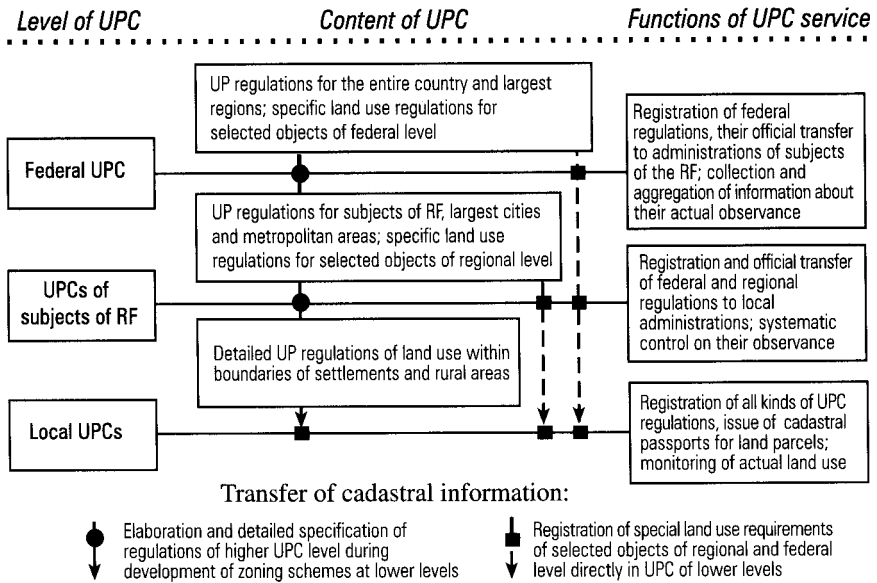
## **8.3 The Russian Urban Planning Cadastre**

### **8.3.1 Hierarchical Organization of Land Use Regulations**

As a rule, all types of urban planning regulations are established in the course of development and adoption of special zoning plans. These plans are developed as a part of the main documents of spatial planning: the General Scheme of Settlement and Spatial Organization in the RF; schemes of spatial organization of major regions; schemes and projects of regional planning; master plans of cities; and physical plans of urban districts. Each land owner (land user), be it a private owner or a government agency, will be legally responsible for non-compliance with the regulations if his/her activities violate requirements (limitations) specified in the zoning plan. The term 'urban planning regulation', in this case, means the complete set of official (certified) data to be included (registered) in the UPC. It includes:

- a classification basis for delimiting each of the functional, environmental or infrastructural zones;
- a description of all urban planning regulations and limitations within the boundaries of each of these zones, including land use rules and norms; and
- a set of quantitative parameters for assessing potential violations of the regulations on the side of various agencies of spatial management and planning, and private land owners, who are legally responsible for compliance with land use regulations.

Hierarchical organization, allowing it to trace and reconcile the interests of upper-level administration on the local level, is a fundamental principle of the UPC. The three hierarchical levels in the developing system correspond to the three main levels of spatial management and planning specified in the Constitution: federal, regional (in the competence of administrations of the subjects of RF), and municipal (in the competence of local self-government). At each of these levels, a separate set of urban planning regulations is to be developed (Fig. 8.2):



**Fig. 8.2:** The principles of the hierarchical organisation of the UPC in the RF

**Federal.** At this level, the main goal of regulations is to create the necessary foundation for implementing federal policies as regards industrial location, settlement, and environmental protection. Regulations of this rank are established either for large areas (zones) or for relatively small but strategically important locations: nodes of transportation and utilities networks, critical industrial enterprises, protected landscapes, historical monuments, *et cetera*. An additional role of unified federal-level regulations for large (inter-regional) zones is to facilitate coordination between authorities of neighbouring subjects of the RF in the development of boundary areas.

**Regional.** The set of regulatory goals at this level (oblast, krai, republic) is similar to the federal level. However, accounting for specific interests and managerial tasks of each subject of the RF requires, as a rule, a more detailed elaboration of the contents of each regulation, and a higher level of spatial detail. Additionally, regulations of this level develop the legal framework for the activities of subordinate municipal authorities (cities and other urban settlements, administrative districts) in controlling land use within their area. In doing so, regional-level administrations should follow the requirements and limitations established for them on the upper (federal) level.

**Local.** In the proposed hierarchical system, the task of implementing the major portion of federal and regional-level regulations is assigned to municipal administrations. The task of the latter is to control, in maximum detail, the activities of land and real estate users in practicing specific land uses within their parcels, through the

development and implementation of their own municipal regulations which, in turn, should comply with regulations established at higher levels. These detailed regulations are recorded in special land use 'passports' which are issued to land owners by local authorities.

As this conceptual scheme shows, there are two main routes of information transfer from upper to lower levels of the hierarchy. The first route suggests that a large portion of federal and regional regulations apply to relatively large (in terms of number of municipalities, area size) regulative zones and are subject to step-wise specification in developing land use regulations of the lower levels. Such regulations are not intended for direct control of economic activity within parcels, and are called 'zonal' or 'indirect' regulations. The second route of transferring the content of urban planning regulations to the lower level applies to relatively small, but important (from an environmental or economic perspective) areas. These areas are directly regulated from their level of subordination: federal, regional or oblast. Delimiting such areas is necessary due to the existence of specific federal and/or regional-level interests, which require direct control of the seamless functioning of these objects. This control is implemented on the municipal level by representatives of the central government, or subjects of the RF. Regulations of this kind are called 'object-centered' or 'direct' regulations. The areas regulated in this way are called 'cadastral objects' of a certain federal or regional status. Direct regulation of a small number of cadastral objects of federal or regional level takes precedence over indirect or zonal regulation on the same level. Regulations established on the lower, municipal level are, by definition, of the direct kind.

### 8.3.2 Types of Zoning Regulations

Each administrative unit of the RF can be covered by several compact zones of different kinds, with specific regimes either prioritizing or limiting certain uses of land and other objects. Such zoning is a part of spatial planning documents developed on three levels: the General Scheme of Settlement and Spatial Organization; schemes of regional planning of subjects of the RF, and physical planning projects for municipalities. At each of these three levels, four kinds of zones can be delimited:

- *functional* zones, which are related to industrial and other objects of various economic specialization;
- *developmental* zones, which establish allowable (or desirable) degrees of transformation of natural and historical-cultural landscapes;
- *environmental* zones, which represent the established regimes of nature protection or restoration (air and water quality, valuable natural and cultural landscapes, soils and vegetation, groundwater, animal life); and
- *resource and infrastructural* zones, which establish the usage regime of natural resources in short supply (clean water, suitable lands for residential, agricultural, and recreation zones, mineral waters) and regulate the activity of utility, transportation and social infrastructure establishments (in education, health care, recreation, services).

Let us consider each of these types of zoning in more detail:

**Functional Zoning.** In the general case, three types of functional zones are expected to be delimited at the federal level:

- zones with predominant development of urban functions;
- zones with predominant development of agriculture; and
- zones with predominant development of forest service, recreational, and environmental conservation functions.

On the level of subjects of the RF, functional zoning will be derived from such zoning on the federal level, through a more detailed subdivision of the federal zones, and a more narrow specification of limitations (or prescriptions) regarding land use. For example, federal-level regulations will specify that, for all local zones within a certain region, not less than 50 per cent of the area should be reserved for 'titular' land uses. At the same time, on the level of subjects of the RF a more rigid set of regulations is established: e.g. the titular land use should be found on no less than 70-80 per cent of the area of the local zones. On the municipal level of such kind of zoning, the number of allowed land uses is limited to five to ten, while other land uses are explicitly excluded for relatively small areas of local zones.

**Developmental Zoning.** The tasks of federal-level developmental zoning include:

- delimiting regional-level (inter-oblast) zones of various (prescriptive or restrictive) regulations regarding economic and urban development;
- delimiting large metropolitan areas, within which special regulatory regimes need to be implemented; and
- delimiting zones of historical, cultural, and/or natural landscapes of federal (national) value, where establishment of special protection regimes is within the mandate of federal-level authorities.

On the level of subjects of the RF, recommendations of federal-level zoning are specified at a more detailed level. In particular, more specific requirements for the intensity of economic development and the state of the environment within the core and periphery of metropolitan areas are established, and historical or natural landscapes of regional importance are delimited. At the lowest, municipal level of the developmental zoning, land use regimes are specified further, with the focus on such parameters as maximum allowable building densities and heights, proportions of green areas, hard-surfaced roads and densities of utilities.

**Environmental Zoning.** This regulatory zoning is aimed at the maintenance and reproduction of the normative state of the environment. The federal-level environmental zones can be of at least three types:

- zones of comprehensive protection of ecosystems;
- zones of protection of separate elements of ecosystems (soils, air and water basins, animal habitats, vegetation); and
- zones of concentration of protective efforts against natural or man-induced hazards.



At the level of subjects of the RF, the federal zones are subdivided into smaller areas, not necessarily aligned with the upper level administrative boundaries. They are characterized either by unique combinations of microclimatic, geologic and hydrogeologic conditions, or by location in regard to strong sources of pollution or other man-induced hazards. At the lowest, municipal level of zoning, the zone boundaries should follow parcel boundaries, in order to avoid uncertainty in regulations as specified in the passports.

**Resource and Infrastructural Zoning.** The goal of this last kind of zoning is to regulate, within the administrative and parcel boundaries, all norms and rules of access to various resources including:

- natural resources of non-industrial application (water, land, recreation); and
- established or planned centers and objects of social and recreational use of inter-settlement significance.

The zoning regulations also include official guarantees or restrictions on access to the resources for all land and real estate owners. The three levels of this zoning: federal, regional, and local (municipal), specify access conditions to resources of the respective level of importance. At the municipal level, the regulations are formulated for parcel owners, with regard to the parcel's location within a zone, and recorded in cadastral passports of each parcel.

### 8.3.3 Structure and Content of the Information Base for the Cadastre

Cadastral information which forms the content of the UPC on various levels, can be classified from several perspectives:

- by legal status: certified legal, or official, information, which forms the basis for issuing cadastral passports and other official documents of the UPC, versus reference information, which is developed on requests from various administrative, planning, judicial organizations, real estate companies;
- by spatial extent: information about the area within the borders of a cadastral unit (internal) versus information on interaction between a cadastral unit and other neighbour units, along with regulations governing such interaction (external);
- by the thematic content of land use regulation: functional, environmental, engineering, connected with spatial organization, related to the use of infrastructure and services, water supply, roads, sewage, electric lines;
- by the role in cadastral regulation: information on norms and land use regulations reflecting the model of spatial organization derived from master plans and regional planning works, versus actual land use and other information from statistical reporting, air-photos and remote sensing, ground surveys;
- by the origin: information developed within the local UPC service, and 'imported' from the UPC of other hierarchical levels or from other kinds of cadastre; and
- by the form of presentation: cartographic versus textual.

Applications of cadastral information are summarized in Table 8.1.

**Table 8.1.** Expected applications and potential users of the UPC

Expected applications of cadastral information	Potential users of urban planning cadastre						
	Administration	Planners, researchers	Investors	Realtors	Land owners	Communities	Courts, legal system
Issuing orders for physical planning, surveying, land resources assessment	+						
Adoption, coordination, and control on implementation of projects and target programs	+						
Collection of data for projects and research in urban and regional planning, land use		+	+				
Evaluation of investment options in territorial economic development	+	+	+		+		
Assessment of 'basic' prices for taxation and fees for resource use	+	+	+	+	+		
Conflict resolution regarding land use and zoning regulations	+		+	+	+	+	+
Informing community and private owners about land use and real estate regulations	+				+	+	
Registering property rights or renting agreements regarding land and real estate	+		+	+	+		+

Note: + designates users who must consult cadastral information in a given sphere

## 8.4 Cadastral Services

### 8.4.1 Functions of Cadastral Services

Development of the UPC implies a creation of a ramified network of cadastral services as part of administrations on all levels: on the level of Government of the RF (within the State Committee on Housing and Construction Policy); at the administrations of all subjects of the RF (including Moscow and St. Petersburg), and at executive departments of all municipalities (cities and districts). These services will be responsible for:

- creation and maintenance of records on current land use and official land use regulations (zonal and object) for each elementary cadastral unit;
- maintenance of cartographic databases of land use and zoning for entire cadastral areas, and each elementary cadastral unit;
- issuance of official cadastral documents (passports) to administrative organs and property owners, as well as reference land use information on the requests of the executive, legislative and judicial branches of administration;
- processing re-zoning requests, testing the correctness of applications for any developments on the land (including building, change in economic use; changes in technology and scope of exploitation of natural resources, changes in natural environment); and
- information exchange between the UPC of different levels, as well as between other cadastres and the UPC.

### 8.4.2 Cadastral Documents

According to the proposed system, all land parcels on the local level shall receive so called cadastral passports which will become the principal legal document regulating land use within the parcel. On the higher levels of cadastre, the equivalent of the passports will be special cadastral documents (regulations, licenses) issued by cadastral services of federal and regional levels to administrations of subjects of the RF, cities and other urban settlements, and rural districts. In particular, authorities responsible for certifying ownership rights on land and real estate should require a cadastral passport issued by a certified cadastral service, as one of conditions of the application. This will serve as evidence of the fact that the future land owner is aware of regulations governing the use of the parcel. At the same time, all other potential restrictions on the freedom of economic activity (not recorded in the cadastral passport) will not be considered legally binding. Cadastral passports, and similar official documents issued by the cadastral service, will be accepted by courts as the only source of regulatory information in all arbitration of cases related to land and real estate use. Sample contents of a cadastral passport are shown in Fig. 8.3.

- 1 The title of the administrative body issuing the passport, and the administrative status of the urban planning cadastre which provided data for the information contained in the passport.
- 2 General characteristics of the parcel:
  - location (text and map) of the parcel, as related to a cadastral area within which it is located (city, administrative district, *et cetera*);
  - surveyor's plan of the parcel, with boundary coordinates and locations of all real estate objects, hydrologic features, green areas, connectors of mainline transportation and utilities networks, *et cetera*, within the parcel; and
  - special conditions for the parcel (microclimate, resource potential, established industrial specialisation, conditions of connecting to utilities and road networks, location in settlement network, ecological situation, *et cetera*).
- 3 Urban planning regulations of land use:
  - 'object' regulations, established for those cadastral areas of federal and/or regional importance which either contain, or are within, the parcel. These regulations may include: restrictions on certain land uses within the parcel or neighbouring parcels; restrictions on economic development (housing density, utilities density, use of sub-surface space) and landscape changes (proportion of built-up and open areas, number of stories, style characteristics of buildings, proportion of green areas, *et cetera*); special requirements to the state of certain ecosystem components; restrictions on the use of natural resources (water, forest, mineral resources *et cetera*); and
  - 'zonal' regulations for the parcel, derived from the zoning plan on the municipal level. This part includes interpretation of the four kinds of regulative zoning (functional, developmental, environmental, infrastructural), as well as quantitative criteria of compliance with zoning.
- 4 Current degree of compliance with cadastral regulations:
  - violations of systematic deviations from the criteria set forth in 'object' regulations of federal and regional statute (if they exist), with records of measures taken to correct problems;
  - violations or systematic deviations from the criteria set forth in 'zonal' regulations on the municipal level, with records of measures taken to correct deviations; and
  - records of franchises and other preferences established for the owner (user) of the parcel as regards cadastral regulations, with the indication of the administrative bodies which issued amendments, and terms of the latter.
- 5 Official certificate from UPC of lower (municipal) level, describing the assessed value of the parcel as affected by cadastral regulations, plus the base value of all property located within it (with the time and authors of the assessment).

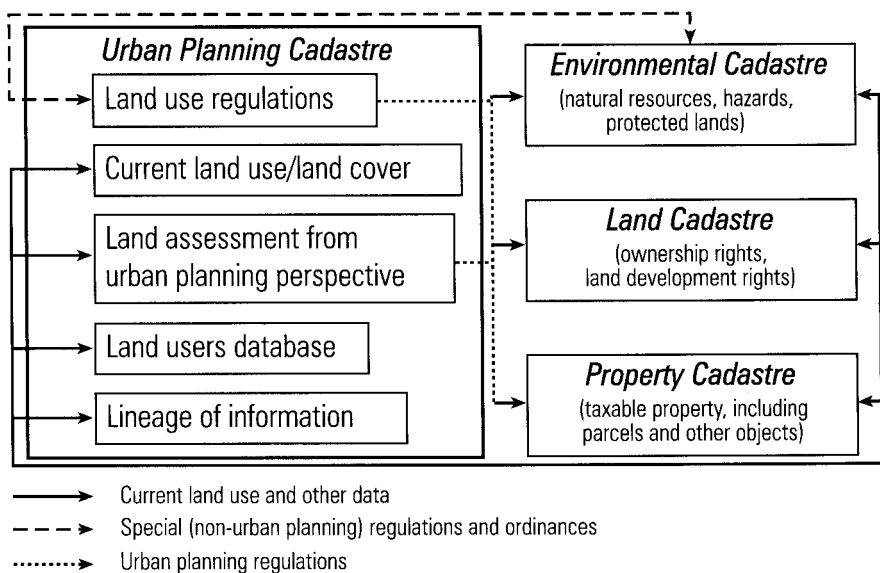
NB: Base value is assessed by experts using standard methodology, for the purposes of taxation, compensation for land, *et cetera*

**Fig. 8.3.** The content of a parcel cadastral passport issued by cadastral services at the municipal level to each land owner (user) at the time of registering his/her ownership rights

By giving legal status to the cadastral passports, the system is expected to counter corruption in the emerging land and real estate markets and reduce the confusion about responsibilities of various land interest groups as well as the authorities of various territorial levels. At the same time, it will promote the spatial organization of the territory as envisioned in the master plans of cities and projects of regional planning, by providing information for the enforcement of zoning regulations. Additionally, this information will be used for differentiation of tax rates and fees for resource use. Thus, the UPC will play an important role as the vehicle of implementation for spatial planning ideas.

### 8.4.3 Connection with Other Cadastres and Cadastral Services

Coordination with traditional land cadastres, as well as other specific cadastres being developed in Russia (Fig. 8.4), is one of the fundamental principles of the UPC. The idea behind this separation into several distinct cadastral systems is to preserve, in Russia, the established division between four groups of agencies (urban and regional planning, land management, environmental, and fiscal), each of which has a similar hierarchical organization. As Fig. 8.4 shows, the UPC service is meant to be responsible for coordination and compatibility of the data developed within each of the four systems, since its main purpose is the registration of a complete set of parameters affecting land use.

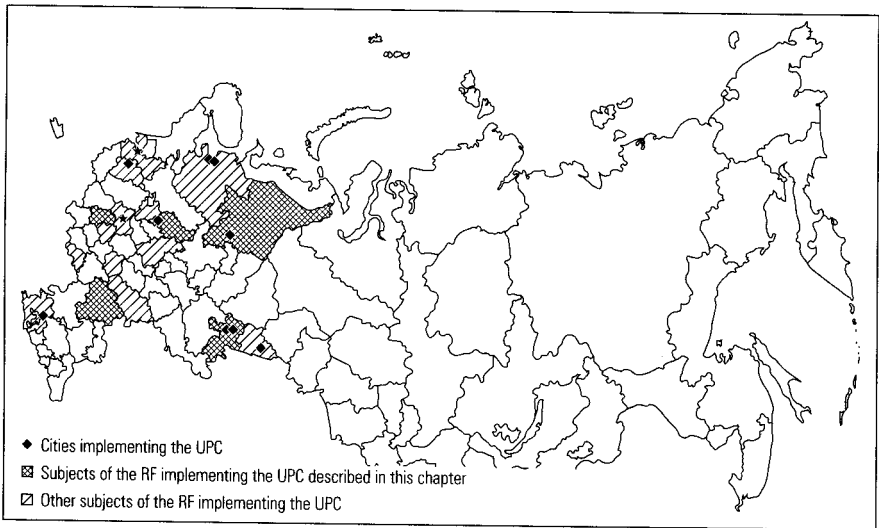


**Fig. 8.4.** The relationships between the UPC and other spatial records systems

## 8.5 Implementation of the UPC and the Functions of a Cadastral GIS

### 8.5.1 Implementation Strategies

During 1996-97, under the auspices of the Government of the RF, the Program of Creation and Maintenance of the Urban Planning Cadastre of the Russian Federation (Naimark 1996, Razumov 1996, Vilner 1996) is being developed. For this purpose, a cooperative fund has been created by subjects of the RF, with the goal to support the development of the UPC. The first efforts were directed at creation of methodological foundations for the cadastre. The main principles of the UPC (including the content of urban planning regulations for various hierarchical levels) have been developed and adopted by the Construction Ministry of the Russian Federation. Currently, several oblasts and cities started development of UPC projects on the regional and local levels (Fig. 8.5).



**Fig. 8.5.** Entities implementing the UPC, 1996

Two main approaches to implementing the UPC have been visible:

- creating data banks of urban planning information (on all media), without waiting for specific methodological or planning documents regarding the UPC; and
- special planning documents (Technical Projects of the UPC) are being ordered and developed which include recommendations on computer and GIS support of the UPC and which implement the methodology expressed in this chapter.

The first approach is characteristic for about 20 subjects of the RF, for 13 large (with population over 250,000) and five medium (50,000-100,000) cities, where the UPC is being developed with different degrees of success. The second approach is visible in relatively small number of subjects of the RF (Volgograd, Kaluga, Kostroma and Chelyabinsk oblasts, Republic of Komi), as well as in cities of Arkhangelsk, Severodvinsk, Kostroma, Syktyvkar, Chelyabinsk, Kurgan, Novgorod, Zlatoust (Chelyabinsk oblast), Kropotkin (Krasnodar krai).

The general level of economic well-being of a city or a region, and the availability of skilled professionals, has been possibly one of the most important factors of success in the development of cadastre. Moscow and St. Petersburg stand out in this respect, as examples of successful reform and the first in developing cadastral infrastructures. Several cities, such as Ufa, Tomsk, and Taganrog (Kholodkov 1995), with a number of well-established military cartographic services interested in conversion, belong to the same group of cadastral 'forerunners'. The established climate for international investments and the existence of foreign (American, German, British) business centres, or established sister-city relationships, are also important in boosting cadastral development (Zadontsev 1995). In these cases, the pressure of potential foreign investors, who are interested in information about properties and regulations in a familiar form, is clearly felt. However, without the willingness of local administration to reform land allocation and regulation practices, the UPC scheme would not work. This 'personal factor', the 'progressive' program and way of thinking of a city major, governor, republic president or chief architect, are clearly critical for the success of the new approach to land regulation. Beyond Moscow and St. Petersburg, examples of this effect are the cities of Novgorod and Kropotkin, Nizhegorodskaya oblast (former Gorky oblast), and the Republic of Komi.

### 8.5.2 Organization of Cadastral Services

The majority of the services of the UPC are created under the aegis of city and oblast Departments of Urban Planning and Architecture. In fewer cases, these services are organized as part of the Department of Land Surveying. The staff of cadastral services range, depending on the city and region, from just a few people (the city of Kropotkin, for example), to about a hundred (St. Petersburg). There are no official data about the prices of services, but, as our estimates show, in certain cases the revenue covers up to 70 per cent of all the expenses necessary for functioning and development of cadastral services. For example, in the medium-sized city of Kropotkin, one certificate from the UPC service costs 1 million rubles on average (about \$170 in 1997 prices). From these revenues, 25 per cent go towards the development of the equipment base of the service. There are also examples of establishing not-for-profit companies under the aegis of respective administrative bodies which sell urban planning information and finance their staff and equipment from the revenues. However, the most common source of financing for cadastral services is still oblast or city budgets.

In June 1996, the State Central Research Institute of Urban Planning conducted a questionnaire survey of the administrations of over 30 RF subjects, focused on the

infrastructure and pre-requisites for the development of UPC services. The main problems and suggestions in developing the UPC, as indicated by participants, were:

- the need for a special decision of the Russian Government about mandatory development of the UPC, with allocation of financial resources;
- centralized development and dissemination of the UPC methodology and materials to cities and regions; and
- centralized development of special software for the UPC, including Geographic Information Systems, addressing hardware recommendations, compatibility issues and developing sample data bases. This issue is discussed in the next section.

### 8.5.3 Computerization of the UPC: Main Problems and Tasks

The UPC development is impossible without modern geographic information technology providing for effective and uniform management of cadastral information. Following from the principles of the UPC organization, the system should be able to support information exchange and integration across different levels of cadastre, as well as between different cadastres (Fig. 8.4) and respond to several types of queries to a multi-layer cadastral database. Some of the specific functions of a cadastral GIS envisioned in the project, are:

- ability to overlay and adjust various kinds of zoning, in order to align various zoning boundaries with the network of elementary cadastral units;
- consistency testing of land use regulations for cadastral units experiencing changes in spatial configuration;
- tools for testing validity of input information;
- ability to respond to queries about cadastral units, with a specified combination of UPC regulations, posed to a distributed database;
- ability to automatically compile, for a specified cadastral unit, all information regarding its internal (on land use) and external (on interaction with neighbors) urban planning regulations. This information forms the cartographic and textual content of the cadastral passports described earlier;
- ability to incorporate reference information from diverse sources, in different formats, and integrate it with other cadastral data; and
- emphasis on database security.

Computerized databases and GIS are already used in several cities and regions implementing both approaches (including the cities of Moscow and St. Petersburg, Ufa, Tomsk, Kostroma, Perm, (Vinogradov *et al.* 1996), Rostov-on-Don, Taganrog, Belovo; Leningrad and Nizhegorodskaya oblasts, Republics of Komi and Adyge). The most pressing problems cities and regions face in developing cadastral GIS, are connected with incompatibility of various software and databases, inadequate hardware, and inadequate development of communication networks. The most popular software packages used in these areas are: Arc/Info (most popular), ArcView, MapInfo, Intergraph, GeoGraph, GeoDraw and AutoCAD, as well as domestic GIS which are implemented by local military cartographic agencies currently looking for new sources of revenues.



## 8.6 Conclusion

At the time of writing this chapter, the system of the UPC in Russia is still at an early stage of development. It has the goal of promoting efficient resolution of land use and zoning conflicts, and regulating various aspects of land use based on its comprehensive assessment from the perspective of urban and regional planning. There are at least three important aspects of the expected outcome of the UPC implementation:

- *economic*: the UPC will stimulate the adoption of federal and local laws regulating land and real estate markets, and will provide information support for such markets with a comprehensive account of spatial organization in the assessment of land value and determining taxation rates;
- *social and political*: the uniform system of land regulation and equitable treatment of different groups of owners and land developers will lead to stabilization on the social and political arena, narrowing the criminal sphere, and improving the business climate for international investments; and
- *spatial organization*: the currently spontaneous process of land use will be placed into the framework of realization of the adopted projects of regional planning and master plans of cities.

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