

Cadastral Framework and Development Issues in the Ukraine and Baltic Republics

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Introduction.

Cadastral issues are both problematic and vital to the transformation of post-soviet states such as the Baltic Republics (Latvia, Lithuania and Estonia) and the Ukraine as well as other former socialist (and communist) states. This is because the ownership of land and the houses, apartments, factories, infrastructure and resources on and associated with that land is a contentious and economically vital issue. Therefore mapping, managing associated attribute data and particularly using GIS to inventory, analyze and resolve issues related to lands is also an important issue. The value of examining the processes of cadastral mapping in several post-soviet states is that it can help compare and contrast successes and failures and the causes of these various outcomes. This in turn can yield lessons that can be applied in other similarly situated countries. Specifically, the Baltic states have been fairly successful in developing comprehensive multi-layer multi-purpose national cadastral geospatial data linked to national land registry data bases in the years since Independence from the Soviet Union (Lithuania was the first republic to leave the soviet union). In contrast the Ukraine has much larger problems (and a much larger land area (it is the largest nation in Europe)). One of the valuable insights from this paper is the reasons that the Baltic sates have been relatively successful while the Ukraine has struggled and perhaps actually retrogressed.

Historical Background.

When one examines the present day success or failures of cadastral systems history is of great importance. Nations that did not embrace systematic land partitioning nor maintain accurate public records are challenged in creating GIS based cadastral data today even if they have the financial and technological wherewithal to do so. This is because there are challenges beyond precisely determining prescribed boundaries or adding layers of streets hydrography, political boundaries to a GIS. If there are fundamental issues of who owns property or as under socialist systems of the right to own private property then the process of creating a cadastral map will be a greater challenge. Add to this the problems posed by countries whose land partitioning and ownership systems have changed (such as the change from Czarist Russia to the Soviet Union to Independent post soviet nations). Even more difficult can be countries that are composed of several other countries with differing land partitioning and land ownership systems. This is exactly why the historical background matters when one considers the Baltic Republics and The Ukraine. The Baltic republics were once either independent or allied with Poland in the case of Lithuania or controlled by Sweden in the case of Latvia and Estonia. Sweden besides being a regional military power was and is an extremely well organized nation; it had systematic mapping and land partitioning programs in the 16th century. Poland likewise was a far more progressive and wealthy area historically than many of the States around it including in

particular Russia. Russian land mapping and partitioning was very primitive. The vast extent of Russia meant that ownership at a scale where precision did not matter. Furthermore, communal ownership of farm land was common in most rural areas and the large estates with their associated serfs that existed were often bestowed by absolute fiat and used Rivers as delimiters. The net result was that it was not until the 1860 that mapping of land ownership began to take place in Russia. The situation in the Ukraine was even more complex. The Ukraine has always been a borderland, invaded by poles, Russians, Turks, Swedes and many others Today it is composed of areas that were once part of Poland, Lithuania, Turkey, Romania, Poland, Austria and the Czech Republic (and many of these areas were part of Russia and of course the Soviet Union). Not all of these nations had developed land partitioning systems or cadastral maps. But some did. Thus for example the area of Galicia in the Western Ukraine was part of Austria-Hungary until 1918, then part of Poland until 1945. In these years these nations had cadastral systems and that framework exists today to build upon. However, most parts of the Ukraine were either Russian, or part of Romania (Bukovina). A small area of Ruthenia was once part of the Czech Republic and previously was part of Austria. This area also is more advanced in building Cadastral maps than other areas of the country (Kain 1992) a detailed examination of the differing situation in the well organized Scandinavian oriented land of Estonia is instructive. Estonia is the most Scandinavian oriented of the Baltic States. It is also the Post-Soviet State that had the highest proportion of private home ownership. These factors helped explain some of the success that Estonia has achieved with its cadastral development. Then the predecessor of the current Estonian land cadastre was a “bushel-book” (vakuraamat) which was established as early as the 13th century to take an inventory of peasants’ duties to a manor. At the beginning of the 19th century the Livland Board of Audit was created and the main purpose of it was to gather the bushel-book materials and surveyed land unit maps from all counties in Estonia and to finish the land valuation of manors. After the Estonian independence was declared on the 24th of February 1918, the Ministry of Agriculture, and as part of it, the Cadastral Office were founded. The first challenge was to carry out land reform to distribute land that was dispossessed from manors. The structure of the Cadastral Office was quite similar to that of today’s land cadastre regarding both the institutional structure and content. After the 17th of June 1940, when the Soviet Union occupied Estonia, all land was nationalized. 210,000 cadastral units had been registered in the cadastre up to that time. After the re-establishment of Soviet control all registration was stopped until the 1990s (Kuus, 2009) .

Cadastral Framework in the Ukraine and The Baltic Republics

The Ukraine has a national Cadastral Agency with a headquarters in Kyiv and uses ArcGIS for mapping and geo-database development. It was created in 1992, but did not begin to work actively until about 1996 and land privatization efforts were largely delayed until 2004 and the political changes which took place following the Orange revolution. The agency uses GIS along with GPS, aerial photogrammetric methods and available 1:25,000 scale topographic and 1:10,000 scale maps of urban areas portraying building footprints in its work. There is also a land registry agency that maintains land records and has computerized those records. Land registry offices are located in each oblast (regional government equivalent to a large county or small state in the U.S.) The Ukraine is a very large nation by European standards and as such has a number of Regions and an Autonomous Republic on the Crimean peninsula to the south. The Western

Region of the country has been the most active on the local level in tracking and maintaining land records. The regions of the Ukraine are divided into Districts called Oblasts. The Zarkarpaty oblast in far western Ukraine and the Lviv Oblast in western Ukraine are among the local governments most active in using GIS for mapping and managing cadastral data. However an overall national multi-purpose cadastre does not exist in the Ukraine. Nor is there a linked set of property registry data nor is tax valuation information is neither a GIS nor a database linked to the cadastral map. The cadastral map itself has some serious issues and up-dating the property status and boundary information is made harder by numerous abandoned properties as well as the decay of the geodetic control network which was last maintained in good condition during the mid 1980's. Recently the Ukraine has made an effort to use geospatial technologies to better define national boundaries such as those off-shore in the black sea and between the Ukraine and Moldova. This effort may have a spill-over effect into mapping of cadastral data eventually.

In Latvia, there is a State Land Service (Barvika, 2009). The State Land Service (SLS) is a state institution, founded in 1992, with its main responsibility the maintenance of a National Real Estate Cadastre Information System (cadastre) and State Address Registry, as well as a real estate valuation system for taxation purposes. It is also an active participant in the realization of land reforms. Today the land reforms in Latvia are in the process of finalization. SLS's main role in land reform is the registration of property data in a GIS based cadastre which uses ArcGIS software. One feature of the Latvian cadastre is a new data distribution portal of the SLS on the Internet www.kadastrs.lv . This site has both public and secure access it has been up and running since October, 2009. Available types of data that can be obtained from the public portion of this site include: 1) By cadastral number: cadastral designation of cadastre object (land unit, building, group of room or part of land parcel); 2) By title of real property: address of land unit, building, group of room or part of land parcel; 3) Also searched for the above information can be made by location in an interactive map. The secure portion of the site allows authorized users to have access to actual cadastre textual and spatial data, as well can browse and print information. Available information includes: 1) Real properties or lease cadastral number; 2) Content of real estate (land unit, building, group of room or part of land parcel) and their Cadastral designation; 3) Title of real property; 4) land units, buildings, group of rooms, part of land parcels address; 5) land units, buildings, group of rooms, part of land parcels cadastral value; 6) Land Registers partition number (if real property is redistricted in the Land Register); 7) character of land unit, building, group of room or part of land parcel (e.g. area, type of building utilization, type of land use.); 8) owner name and contact information.); 9) encumbrances; 10) other land use restrictions such as- right of way around electricity cables and pipelines, territory of national preserve, territory of biosphere reserve.; The Latvian SLS real estate land cadastre spatial data (cadastral map), can, in addition to parcel boundaries, have the following layers added: 1) topographical plan view map at scale of 1:500; 2) topographical plan view map at scale of 1:2000 for several urban areas such as Riga. 3) Digital orthophoto map at scale of 1:10,000 4) satellite imagery derived map at scale of 1:50,000. In Latvia, as in several other post soviet states, the Cadastre and Land Registry are maintained by different institutions. This means that the State land Service does not perform registration of property ownership. The information on property rights registration procedures is available from the web site: www.zemesgramatas.lv . In Latvia there is also a Geospatial Information Agency which has responsibility for topographic mapping and developing digital orthophotography and remotely sensed imagery but not cadastral mapping their email is www.lgia.gov.lv . Krisjanis (2009)

In Lithuania, there is a State Enterprise Centre of Registers that is using GIS, GPS and laser total station based surveying to map land parcels and associated attribute data. It began its efforts in 1989 and has succeeded in not only accurately mapping land ownership patterns but has placed this material in an interactive web based map. The Ministry of Justice of the Republic of Lithuania is the institution exercising the rights and obligations of the owner of the Centre of Registers. The objectives of the Centre of Registers are to implement the Law on Real Property Registry of the Republic of Lithuania, Law on Real Property Cadastre of the Republic of Lithuania, Law on the Register of Legal Entities of the Republic of Lithuania, regulations of the Government of the Republic of Lithuania regarding administration of the Address Register; to analyse the real property market; to organise real property valuation; to prepare data for real property taxation; and to design information systems on land and other real property. The State Enterprise Centre of Registers is self-financing on the basis of income earned from the providing non-commercial (public) and commercial services. Cadastral surveying of land and buildings is carried out by public and private sectors represented by surveying companies and individual surveyors operating under licenses issued by the National Land Service of the Ministry of Agriculture. Supervision and control over cadastral surveying activities are exercised by two institutions – National Land Service under the Ministry of Agriculture, responsible for the issues related to formation of land parcels, and the Ministry of Environment, responsible for preparation of territorial planning and supervision of infrastructure construction. As of 3 July 2009, 1029 certificates on surveyor's qualification and 296 certificates on expert surveyor's qualification have been issued. Surveyors are employed by 480 licensed companies.

In Lithuania, Cadastral surveying of land is predominantly performed by private surveying companies, while surveys of buildings are mostly done by the public sector (Centre of Registers). For efficient administration of cadastral surveying of structures, the State Enterprise Centre of Registers has recently designed an information system termed "Surveyor" ("Matininkas") intended for surveyors of structures. Technically, the system "Surveyor" is based on Internet technologies and server-client architecture, and has a centralised database and server program. It also uses CAD functionality designed using Autodesk technologies. Currently, the system is used by over 100 companies performing cadastral surveying of structures, on a daily basis – by over 600 surveyors and cadastre administrators. In Lithuania, starting in 2002 a national property valuation system came under development. The Lithuanian real property administration system is a methodically arranged national system for collection, processing and registration of real property data, covering all legally defined data on real property, ownership or ownership rights, as well as graphical data collected and mapped in the process of surveying of real property boundaries or contours. The Lithuanian real property cadastre system methodically describes real property objects (or immovable things) – land parcels, structures, premises and engineering structures, by indentifying *where* an immovable thing is located, and *what* its *quantitative attributes* are. The Lithuanian real property register system ensures legal status of immovable things and rights thereto, and provides data on *who* possesses these objects and *how* they are owned. The Lithuanian real property valuation system ensures collection of qualitative and value data of immovable things, and explains *why* such qualitative attributes of immovable thing have been established, and *what their value* is. Graphical information is a must for effective real property administration, since the majority of real property units are associated with geographical

location of the object – real property location, configuration, and area. Graphical information enables to establish the location of property units, their size, layout and area, use, productivity and value, contributes towards creation of a mechanism reflecting the real property content (size) and ownership. The following immovable things are considered as objects in the Lithuanian Real Property Cadastre: land parcels; structures (including non-completed structure), except for temporary structure and simple structure that does not need any construction permit; and premises formed as separate immovable thing. Each record in the Lithuanian Real Property Cadastre includes *Textual cadastral data* on the object and *Graphical cadastral data* on the object reflecting the position of each thing within the national coordinate system. The following objects, which are formed as separate real property objects according to the procedure established by the Law on Real Property Cadastre, are registered with the Real Property Register: land parcels; structures; flats in multi-flat houses (apartments); business premises. The Real Property Register data contain the following elements: cadastral data on immovable things (objects); graphical data on the location of the registered immovable thing and its position within the national geodetic coordinate system; data on real property rights of immovable things and information on the owners of these properties rights.

In Estonia, the land reform process has been ongoing since 1991 including restitution, privatization and land compensation. The Land Board, which maintains the Land Cadastre, also maintains the system for registering lands and managing cadastral data. In addition to supporting the traditional tasks of cadastral unit registration and land valuation, the system facilitates data queries and analysis. The integrated spatial data contained in the land cadastre have lead the Estonia Land Board to become a leading force in the national GIS community and made it a central institution in the development of a Estonian National Land Information System (LIS). The Estonian Land Board (Maa-amet) was established in 1990. On the 12th of October 1994 the Land Cadastre Act was adopted and this is the basic legal act for the foundation of the Land Cadastre. The chief source of data of the Land Cadastre (Maakataster) is the Ministry of the Environment. The Land Board is responsible to the Minister of Environment for the maintenance of the Land Cadastre, co-ordination and execution of land reform in conformity with valid laws, supervision, organization and co-ordination of the activities in the field of land consolidation, land assessment, geodesy, cartography, and geographical information system development. The Land Board also manages contracts for cadastral and geodetic surveys, and for topographic mapping. The activities of the Land Board are financed 100% from the state budget; all revenue earned by the Land Board goes back to the state budget. . The Department of Land Cadastre within the Land Board of Estonia is divided into five regions and consists altogether of fifteen Local Cadastral Offices (Katasribüroo). The main obligations of the Department of Land Cadastre are to provide the technical support to the cadastral register and to maintain the local cadastral archive and the registration of cadastral changes; maintenance of the cadastral map (GIS) and maintenance of local and central cadastral archives; and Issue of the basic data for cadastral surveying.

The Estonia Land Cadastre is a database consisting of a cadastral register with cadastral maps and cadastral archive. Although the cadastral map is no longer a correct term since the maps have already been replaced by online services and user-guided products, and in the context of database it can be referred to as a geospatial data. The Land Cadastre is a database that is a part of the National Land Information System, which is based on ArcGIS technology. Some of

the data maintained in the “cadastral map” GIS database includes: a cadastral ID-code - cadastral unit information (a plot of land registered in the cadastre as an independent unit). Land coverage information (the use or uses of a cadastral unit permitted by law); boundary point data (points defining the external border of a land unit and these coordinates. boundary marks information, land use type information (intended economic use and/or natural status). The GIS also contains topographic information, which are used as the base map for cadastral maps and which are not parts of the cadastre. The attribute data maintained in the Estonia Cadastral register includes: The cadastral ID-code. It is a code for each cadastral unit and it is a unique primary key consisting of three parts of up to twelve numerical symbols. It contains the cadastral area, the settlement and the number of cadastral unit. The territory of Estonia is divided into cadastral areas that are characterized by five digit codes. The cadastral registrar divides these cadastral areas into settlements and these have three digit codes. The code of each cadastral unit is a four-digit code and is given to the land plot that is registered in the cadastral register. Also the database contains cadastral unit name (or address in the towns), if this exists; location; name of the local government; intended use; total area; area by land use type and intended use. About boundary points the following data is contained in the cadastral database: cadastral ID-code; numbers of boundary points; type of boundary points; type of boundary; coordinates; level of surveying accuracy. About the property owner the following data is contained in the cadastral database: cadastral ID-code; name, address and personal identification code of the owner. The starting point for the development of the Estonian cadastral register was the year 1991. From 1990 until 1996 all spatial data was recorded in the paper format. After a while alphanumeric data was recorded by using a Microsoft Access database that had a simple user connection. Each Cadastral Office had its own database and it was not linked to the databases of other offices. Since the end of the year 2001 the Land Board has been maintaining the Land Cadastre as a database that is part of the Estonian National Land Information System (LIS). The LIS is an ESRI ArcGIS based system. The main LIS server is located in Tallinn at the building of the Land Board and is built upon ESRI and Oracle RAC database architecture.

All databases of the Estonian state that are integrated into LIS are not maintained with the same GIS software, the data representation and analyses are jointly treated. Besides using software developed by the Estonian company Datel (www.datel.ee), the Estonian Land Board maintains LIS using ESRI ArcGIS, along with some applications of Safe FME Desktop and Intergraph’s Geomedia. In provided services the main emphasis has been put on development of a **Web** Map Service (WMS) and Web Feature Service (WFS) using the specification published by the Open Geospatial Consortium (OGC). The main databases in the Estonian National Land Information System are: a Cadastral database; Topographic database; Land productivity and assessment database; Real property transactions database; Real property restrictions database; Geodetic points database; Administrative unit database; and Mineral resources database. The Land Register database is not integrated as part of LIS and is administered by the Centre of Registers and Information Systems (www.rik.ee) working under the Ministry of Justice. The cadastral database is divided in two parts: production service and presentation service. Collecting the cadastral data through a cadastral unit registration event is carried out under the production service. The key part of that is the event-based logging is to satisfy in an optimal way the needs of data exchange with other systems. The Estonian Land Board’s main goal in developing LIS is to integrate more GIS based databases from the public sector into LIS. The challenge of nearest future is to integrate the databases of the Estonian Environmental Register. The Estonian

National Land Information System (LIS) represents most of the data stored in the Land Cadastre using OGC WMS and WFS standards and also the Estonian data exchange layer X-Road services. These technological issues cover all the needs of online services.

The Estonian Land Register operates under the Ministry of Justice and is maintained in law as a legal register (register of title). Making entries in the Land Register creates amends or extinguishes real rights. The Land Cadastre in contrast is maintained in by the Land Board and operates under the Ministry of Environment it is a more technical register – it reflects the data that relates to the geospatial description of land units within an area. Entering a new entry in the Land Register is a notarized transaction and must be formalized at a notary. Registers exchange data through the data exchange layer X-Road, all data queries are online and there is no need for data replication in both databases. Although according to the Land Register and Land Cadastre Acts some of the data must be replicated. In 1993 Estonia introduced a land tax. The Estonian Land Board is responsible for land valuation. The National Tax and Customs Board are responsible for tax collection. Local governments collect taxpayers' information and they also calculate taxable value of land plots. The land tax is a local tax - 100% of revenue goes to the local governments' budget and the tax rate is within limits of 0.1 - 2.5 % per year of assessed value (rates for agricultural land are: 0.1- 2.0 %). The land tax is based on the assessed value of land. So far three assessments have been made: in 1993, 1996 and 2001. The Department of Real Estate Valuation has a responsibility to arrange valuations. Thus Estonia has come from a situation in 1990 where no cadastral maps, no land valuation and no land registry existed to a modern GIS based system with Internet access and integrated Land Registry, Cadastral map and valuation database all part of a National LIS, but independently maintained by three agencies and multiple regional and local offices all sharing data over a LAN and sharing geospatial data with the public through interactive web based maps.

Soviet Land Ownership: Implications for Cadastral Mapping Today.

Most even well educated people presume that in the Soviet Union all land and associated structures and resources belonged to a monolithic communist state with a foci in Moscow and tentacles extending across eleven time zones. This is a fallacy. In point of fact there were many classes and forms of land and real property ownership. The importance of this fact is that it is a much more convoluted and involved processes to now resolve who owns the lands and real property of the former Soviet Union than if it was all State property, which the successor states could bestow to new owners in a more or less rational fashion. Firstly, there were many levels of government under the soviet union and the top level The All Union government based in Moscow controlled relatively little property (Military bases such as the navy base in Sevastopol Ukraine which the Russian Republic still owns), Space ports like the Bykonur Cosmodrome in Kazakhstan and other military property. Individual Soviet Socialist Republics (there were 15, of which we are concerned in this paper with 4) had their own property including state forests, natural reserves, and State farms. Then there were numerous autonomous republics such as Chechen-Ingush, Abkhazia, Nagorno-Karabakh, Ossetia (all which have gone to war to prevent take over by SSR's in the post soviet chaos). These autonomous republics also had property they controlled. Much more property was controlled by regional Oblast Governments. But most of the housing stock in the Soviet Union (and the Ukraine, but not in Estonia) was controlled by

municipal governments. City governments erected apartment houses in which most of the population resided. Then many government agencies at all levels had their own buildings if not exactly control of the land under them.

These different levels can be viewed as all part of a State, but that would be naive since these often were in conflict and were very jealous of prerogatives as well as in many areas such as the Caucasus, Crimea and Central Asian extremely corrupt. These different levels of government did not control the most land in the Soviet Union. Most land was controlled by collective farms. These farms were quasi independent; they took out loans, made decisions by consensus and shared proceeds of sales of farm products among the inhabitants. In some areas collective farmers lived in apartment buildings built by the collective. But usually they lived in detached homes. What is surprising is that these homes were private property of the people living in them. In many cases they predated the society period. One could buy, sell and inherit these homes, what one had trouble doing in the Soviet period was fixing them, except by stealing materials from the collective farm. In Estonia the majority of people lived in the soviet period in such private homes. That now makes the process of building a national private property system far easier than it would be otherwise. Besides the private homes (albeit on Communal collective farm land) there were so called private plots associated with each house (possible at a separate location more suitable for agriculture. These private plots were essential to the soviet economy. They were the most productive (and really only productive_) agricultural areas. Fertilizers, the best soil and infinite care was lavished on these often 1/10 hectare plots that produced not only the pickles, fruits, berries and dill but also a large part of the stable diet of cabbage and potatoes, goats, cattle and poultry were also concentrated and cherished here. It is estimated that 10% of all soviet food and the majority of vegetables came from these private plots. The private plot was so central to survival in the soviet union that urban dwellers also had their own version the dacha, not a comfortable vacation home on a lake as for the party elite, but a shack lean to or tent but with its own 1/10 hectare that grew the summer vegetables and canned foods essential to varying the diet of urban dwellers most of whom were entitled though their jobs to these dachas (built with scrounged materials) and the associated garden plots. One can perhaps begin to see the complexity of unraveling who owns these private plots. Is it the collective farm, the factory that dedicated an area of dachas for staff or the individuals who sometimes brick by brick and shovel by shovel built the house and brought in the top soils to make the dacha desirable the rightful owner?

There are other private detached homes mostly in suburban and rural areas. Any as with most things particularly in the more dysfunctional Ukraine the status of these homes is problematic. Basically the older homes were mostly bestowed as gifts. The newer homes are often on shaky ground legally and sometimes physically. These issues can be illustrated by some private homes in the Western Ukraine Oblast of Zarkarpaty. In the regional capital of Evanofrankvist, a number of newly built suburban villas and located on a scenic location on former municipal property next to the region's largest river. Why was this land not used for agriculture or housing formerly? Because Soviet Era planners recognized it is in a flood zone. The naive buyers of these riverside homes do not recognize that not only is the land under their homes probably not owned by the developer but the ground under their homes is quite likely to be likely washed away in the frequent spring floods. Farther into the Karpaty Mountains one in this same oblast finds the resort village of Yerenche. Yeremche was a resort is when the area was

part of the Austrian province of Galicia and comfortable vacation homes are scattered in the hill slopes (along with newer ski resorts). When in 1945 soviet troops overran the area they displaced not only the Germans but the Bourgeois propertied class Poles who moistly had lived there for generations. In the Village some typically nondescript Stalinist style apartments were built, but Soviet local authorities were not foolish enough to tear down or divide into cubicles spacyots country manors. Instead they awarded these homes to deserving often semi retired officials. The rights of the Polish owners were irrelevant. But what rights do the new tenants have? Perhaps they have a fading bit of paper with a seal and signature that says "In honor of service in the Great patriotic war, Comrade Ivan Ivanovich is hereby given use of the Pilsudski Manor. With date July 1945 and the signature of the vice chairman of the Oblast Communist Party accommodations and logistics committee. While the boundaries and possibly even the building footprint of the "Pilsudski manor" might have been originally mapped by the Austrians. Those maps revised or at least more or less maintained by the Poles, The Soviets had no use for such petty details. The current occupant of that home might be an 80 something widow of comrade Ivanovich. But what are her property rights. What in fact is the boundary of the property? It is not just a matter of using laser total station surveying, survey grade GPS, and photogrammetric mapping to tie in the corners of the area that is enclosed by her not rickety 70 year old fence of draw in the footprint of the barn and home or record the square footage of the home and its amenities (which includes a new water heater toilet, washing machine and microwave oven. Who owns the land under the home? Did the party official have the right to bestow the property, what about the rights of the former Polish owners. More to the point, if someone such as a resort developer wanted to force the old lady out would the combination of lawyer's guns and money which is often and not necessarily in that order employed succeed in removing her. Can she sell the property can her naive inherit the property. Does she have any mineral or water rights? The questions are numerous in a system that may have given the right to reside and use a given space but did not trouble itself too much about defining the limits of those rights.

While factories, government agencies and universities had extensive areas of dachas that were awarded to employees (but did the employees ever actually own them?), these same enterprises which might be All Union, Republic, Oblast or independent also built apartment buildings for their workers. After municipal government-built apartments, those built by state enterprises were probably the most numerous and in some industrial areas such as Magneto-gorsk , or Severo-Donetsk or Zaparozhia in the Ukraine they would have been the most common form of housing. IN the chaos of the collapse of the Soviet Union a new class of oligarch has arisen that grabbed (often with criminal methods, often with party connections and often through intelligence and cunning and chutzpah) large chunks of the industrial sector. These oligarchs recognized that the plants were vital, but also the centralized infrastructure and the Housing. Often the heat light and water of worker apartments came from the central plant that was part of the factory. One had little value without the other. Figuring out the limits of ownership of land, plant, equipment, worker housing and other features in cities centered on state or other enterprises now privatized (or nationalized) is very complex. And since oligarchs do not always use legal means much property that was transferred was probably done in a questionable manner. Land Registration, officials, surveyors, and local government officials all have incentives to look the other way when it comes to delving into these transactions. That has important implications for the construction of a national multipurpose cadastre. There is strong resistance to tracking, mapping and particularly transparency when it comes to cadastral data. This is truer in the

Ukraine than in the Baltic States, truer in the Crimean Autonomous Republic portion of the Ukraine than the Ukraine as a whole and also the case in other areas with endemic corruption. The Crimea is a special case since there oligarchs are not only snapping up state enterprises and associated housing but also grabbing estates, state property (especially valued are the vacation villas of high party officials) and even areas in national Parks.

Besides National parks, there were numerous summer camps in nicer areas. One would often find today that the youth camp is now an expensive private golf course controlled by an oligarch. How he got control does not bare to careful scrutiny.

There is a common belief that the USST was hostile to religion and this was true at certain times and generally for smaller sects like Baptists, Jehovah's Witnesses, etc. However the main Orthodox churches, (Russian, Greek, Georgian and Armenian and the Catholic Church) had a symbiotic relationship with the state in many ways. The state co-opted many of these churches at many levels. One thing the state did to co-opt religion was to give the orthodox churches control over church property like churches, cathedrals and monasteries. Many churches were closed, many were converted to other uses (including museums of Atheism) and many were declared historical monuments and closed to worship (or even moved to outdoor museums. However many other churches were given over to the control of the church hierarchy? Although there was a general decline in the number of churches through the 1970's with reforms in the 1980's the number began to grow again and many abandoned churches have been rebuilt and new churches and monasteries opened. In the post soviet world there are numerous churches from the main recognized religious groups in the case of Estonia, the Lutherans, in the Ukraine the Russian Orthodox and Greek Catholic Churches. Thus church property becomes another type of property that had special treatment in the USSR and has a special status in the land registries of the Baltic States and the Ukraine. One of the potential tensions is that new churches are seeking to reopen on locations that historically churches occupied. The churches claim special privileges to do so, but in some areas one church group was favored over another thus a Greek catholic church might have been replaced with a Russian orthodox one and then that church had also closed. Which group now has the right to rebuild a church on that site? In Lithuanian, the Roman Catholic Church is dominant, In Estonia, the Lutheran, but in many areas of the Ukraine both Russian Orthodox and Greek Catholic churches are in competition with each other.

Natural resources such as energy resources and timber are also in a grey area at least in the Ukraine between state ownership and oligarch control. There are many stories of valuable timber, oil gas and mineral resources being snapped up with the connivance of local or regional officials. Rumors that valuable natural gas resources in the central Ukraine have made their way into the hands of politicians who are holding back these resources in connivance with Russian interests are probably false but they give a flavor of the difficulty that surrounds all issues of land ownership and by extension makes efforts to create accurate national cadastral data very difficult. These officials probably also include the land registry officials. Corruption is so pervasive that it infects attitudes about privatization. Foreign investors are viewed as out to steal land in the same way that Nazi's hauled away train loads of the Ukraine's rich Molisols (chernozems). Thus Dutch investors in the tomatoes business had to give up the idea of actually owning land and merely leased a space from a collective farm to build a tomatoes canning facility. Many other investors have taken this option since actually getting private ownership of land (rather than the right to reside in an apartment without rent and pass this right on to another

seller) is very difficult. The process is not however utterly impossible. Many new luxury high-rise apartments are being built in Kyiv, mostly near the Dnepr River. These are big enough investments that the developers want the assurance of private ownership of the land not a 99 year lease or some sort of bargain with a municipal government whose completions will change with the next contentions election. IN order to privatize land a complex multi step process must take place. A portion of that process is a check of existing land registry documents and remapping using current geospatial technologies of the land parcel. In Kyiv the municipal government is a user of ArcGIS so these private proprieties are going to reside in a GIS. These apartments have the amenities such as washing machines, water heaters and adequate power and communications that most Ukrainian apartments lack. They might seem to promise a better future. Of course, only in Kyiv and Lviv does one see such developments while the majority of Ukraine declining population of approximately 46 million will never see a working washing machine in their lifetimes, but they will see that the hot water that used to be available from a centralized stream plant to fill the plastic tub in now only fitfully available. These high rise luxury apartments reserved for small elite but many are being financed by a sort of Ukrainian variant of the “liar’s loan”. In this case, the persons requesting the loan are fictitious, the developers and bankers split the proceeds and the apartments probably will never be completed or occupied. Even if completed it may not be the case that anyone that can afford them can live in them. The Ukraine still practices the system of internal passports and permission to live in desirable cities such as Kyiv or Lviv is routinely denied. Generally, those that can afford the new private apartments can find the means to get permission to reside in these cities but a large proportion of the total population is living there illegally sort of illegal immigrants in their own country. Persons with the right to reside rent free in apartments often do not have the right to sublet these apartments, but they do that and generally to the large number of people who do not official have the right to live or work in say Kyiv. Of course police and housing authorities have larger issues to deal with. But since such subletting is illegal there are not rental contracts. That means that a whole industry has developed of fixers and crooks taking advantage of this non-system. For example, a sub-letter will re-rent an apartment they have no rights at all to. Or the person claiming to be the “owner” will be a crook. Since the advance was paid in cash with no documentation the renter has no recourse when the actual owner shows up. The typical situation is the old lady who goes into the hospital and the apartment hose maintenance person is the ostensible owner. If the old lady dies her relatives may have an interesting time evicting the new tenants.

If this is not a long enough litany categories of land ownership there were also cooperative apartments where a group of people collected enough money to build their own apartment building in an urban area. These were usually nicer than those available from municipal governments. Professionals might invest 40,000 rubles and in a few years have their own apartment in a cooperative building. These tenants had a higher level of property right they could sell and inherit such properties. As many as 3 million cooperative apartments were built in the Soviet Union mostly in the 1960’s. While ownership of these apartments is clear cut today and since they are nicer than average usually the maintenance of the roof, plumbing etc is covered by the better than average financial resources of the tenants. The same cannot be said of other municipal apartments. With a declining population, economic collapse and or stagnation in many areas and no system to pay to maintain water, sewer, electrical and other infrastructure many apartments of the soviet era are falling into ruin. In 1992 law were passed in the Ukraine that essential privatized apartments based on rights of prior possession. Thus people living in

municipal and factory provided apartments mostly could claim these are private property. The problem is the land underneath as well as the roof etc did not belong to the apartment dweller. In many cases even those wishing to maintain and improve their new found property were stuck in a unit that had failing sewer, hot water, centralized steam heat and elevators. AS units were abandoned and tenants did not pay utility assessments this problem only got worse. In it such a pervasive problem in the Ukraine that many commentators feel it is part of a plan to drive these tenants out of what will then become valuable real estate. The truth is that it is just the result of a poorly considered effort in the early 90's to privatize without much thought as to the consequences of giving many people without any resources to maintain or defend their private property rights a small piece of space to call their own.

Although apartment dwellers in cities have a place they can call their own the same cannot be said for their automobiles. Planners in the soviet union made extensive use of green belts, put day care and schools near housing, built playgrounds, parks (often with monumental statuary of soviet heroes gracing (or disfiguring) them, but they uniformly did not include garages in their plans (which were mapped, but not using GIS as the technology just began to be adopted in the USSR at the time of its demise). Automobiles were viewed as something reserved for the *nomenklatura*, and these *aparachniks* would have a car and driver that stayed at an official location (which did have garages and parking lots). Most people would use mass transit in urban (as well as more rural areas). When cars did start to become widespread in private hands in the 1970's the living spaces were already in most cases filled up with other uses. Therefore rickety metal and wooden sheds began to sprout in every town and city. In parks, playgrounds, and in particular in greenbelts and areas where formerly trees or flower beds had been carefully laid out. Local housing officials, local militia and local gangsters (often from the Caucasus the Soviet equivalent of Sicily) were involved. For an initial fee plus continuing payoffs one could have a place to put a car not too far from home. Around railroad stations garages also appeared on wasteland (or more typically carefully planed green belts). Well with the end of the Soviet Union and independence all the Baltic republics and the Ukraine proclaimed the right to reside rent free in ones former apartment. And it was possible to go through a process to privatize the apartment and sell it or convey it to a relative. But what about the garage? The garage was never officially recognized it was not mapped it was not the property of anyone except the gangster who built it and collected the payoffs to keep local officials looking the other way. What rights exist to this garage in a post soviet state? This is yet another unresolved property ownership related problem. In is clear that most inhabitants of the Ukraine who are fortunate to have a car have no real right to the garage in which it is parked and given the climate and crime rate the car without a garage has little value and given the shoddy state of public transportation the car is more essential than ever, thus the apartment has little value. Both the second author of this paper and the wife of the lead author have apartments in the Ukraine In Kyiv and Severo-Donetsk (in the Eastern Ukraine) whose status is uncertain and which have been involved in legal disputes. Another area of dispute is the basement. Most apartments had basements which would be used to store bicycles and the all important cans of pickles and root vegetables from the dacha. Who owns the basement in the building? Can some tenants have more space? Seems like a trivial issue, except that soviet era planners seem to have centralized all services like stores, pharmacies, banks, and the all important liquor store (actually all types of stores sell liquor particularly food markets). The significance of this planning omission is that in the new private property world there is demand for these services plus for casinos and video arcades and internet

café's. In the Soviet Union no business ever was located in the ground floor of an apartment. But today, the basement and ground floor are prime real-estate in most cities. Like many real estate transactions the details are very murky, but the results are planning to see. Everywhere bank branches, pharmacies small stores and microscopic video casinos are growing out of the ground floors or 10 and 20 story apartments. These new businesses get permission (perhaps at the point of a gun) from the ground floor tenant, but what about the other tenants. Not very likely, the business besides in the case of 24 hour pharmacies, liquor stores, SOB and Casinos may attract an undesirable element. In any case the other tenants have no real say. A lot of these businesses extend out from the apartment houses and take over walkways, flower beds, etc. Other open spaces are also filled with probably illegal kiosks. Local officials like to blame foreign immigrants for these rickety constructions but are actually complicit in tolerating them. Where are the land registry and local land use planning officials well they are usually happy to acquiesce to the new use as long as an adequate "facilitating payments" have been made. Efforts of local tenants to remove the most obnoxious tenants have resulted in Kyiv recently in a form of mass action where masked men wielding sledge hammers and crow bars have attacked the ground floor interlopers and tore down the structure.

Conclusion.

While GIS is helping map and manage cadastral data in all three Baltic Republics and the Ukrainian Republic of the former Soviet Union the legacy of land ownership patterns and policies as well as the perversions of land ownership rights such as confiscation and corruption have made the process of building cadastral data challenging, not primarily from the technical issues involved, but due to contradictions, uncertainty and complex history of land use and ownership rights. These issues have over the period since the Independence of These republics gradually been resolved in the Baltic Republics, but they remain basically unresolved in the Ukraine. Its larger size, greater poverty, more complex history of multiple nations existing within its current boundaries, political infighting particularly between western and Eastern Ukraine and lower proportion of private homes and larger proportion of massive state industries and large state and collective farms have all contributed to this relative lack of progress. Nevertheless the success of the Baltic states in creating a modern national multi-purpose cadastre and in fact sharing that data over the Internet can serve as a model and inspiration for similar evolution of cadastral frameworks in the Ukraine and by extension in other nations such as Georgia, Armenia, Azerbaijan, Moldova and possibly some day in Russia itself.

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