

## Questionnaire for the development of ISO 19152:2012 LADM Valuation Module

The ISO 19152:2012 Land Administration Domain Model (LADM) presents a conceptual schema for the specification of property units and their legal and geometric characteristics recorded at cadastre and land register, and relates these datasets with other property related datasets (e.g. addresses, utility networks, building (units), valuation, taxation, land use, land cover) recorded at external registrations.

A recently initiated collaborative research aims at developing a LADM based international information model for one of these external registrations, namely in terms of a Valuation Module for the ISO 19152:2012 LADM. The purpose of this research is to define the semantics of valuation information maintained by public authorities especially for recurrent taxes on immovable property<sup>1</sup>, and to extend the scope of LADM from a fiscal perspective to provide an information model that could be used to construct information systems for immovable property valuation. The preliminary results of this research were documented at the 11<sup>th</sup> 3D Geoinfo Conference<sup>2</sup>.

This questionnaire is prepared as a part of methodology applied for the above-mentioned research which is also supported by FIG Presidency and Chair of FIG Commission 9 Valuation and the Management of Real Estate. The purpose of the questionnaire is to create a world-wide inventory that reveals commonalities and differences among valuation systems used for recurrently levied immovable property taxes. The result of the questionnaire is expected to provide an understanding of the situation of valuation systems, and will be used as source data for the elaboration of the LADM Valuation Extension Module.

Please reply the following questions, and contact us if you have any comments and suggestions:

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<sup>1</sup> Recurrent taxes on immovable property covers taxes levied regularly in respect of the use or ownership of immovable property. These taxes are levied on land and buildings, in the form of a percentage of an assessed property value based on a national rental income, sales price, or capitalised yield; or in terms of other characteristics of real property (e.g., size or location) from which a presumed rent or capital value can be derived. They can be levied on proprietors, tenants, or both; they can also be paid by one level of government to another level of government in respect of property under the jurisdiction of the latter (The OECD classification and interpretative guide 2015, <http://www.oecd.org/tax/tax-policy/oecd-classification-taxes-interpretative-guide.pdf>)

<sup>2</sup> For more information, see: <http://www.isprs-ann-photogramm-remote-sens-spatial-inf-sci.net/IV-2-W1/145/2016/>

## Section A. General questions for property valuation systems in Colombia

Questions	Responses
<p>1. Please indicate the organizations responsible for valuation of properties for property taxation purposes through name in national language and English translation.</p>	<p>The real estate valuation works for tax purposes are carried out by the cadastral authorities, either directly or throughout independent experts under their coordination and jurisdiction.</p> <p>In Spanish:</p> <ul style="list-style-type: none"> <li>• Bogotá D.C.: Unidad Administrativa de Catastro Distrital</li> <li>• Medellín: Catastro de Medellín</li> <li>• Antioquia: Catastro de Antioquia</li> <li>• Resto del país: Instituto Geográfico Agustín Codazzi</li> </ul> <p>English translation:</p> <ul style="list-style-type: none"> <li>• Bogotá D.C.: Administrative Unit of District Cadastre</li> <li>• Medellín: Cadastre of Medellín</li> <li>• Antioquia: Cadastre of Antioquia</li> <li>• Rest of the country: Agustín Codazzi Geographic Institute.</li> </ul>
<p>2. What are the types of objects of valuation for property taxation (e.g. unimproved parcel, building)? Name and date of the ordinance to be listed.</p>	<p>The cadastral appraisal is governed under Law 14 of 1983.</p> <p>Article 4.- As of January 1, 1984, for the purpose of the formation and conservation of the cadastre, the appraisal of each property will be determined by the addition of the partial appraisals practiced independently for the land and for the buildings within the land.</p>
<p>3. Please mention value type (e.g. market value, tax value, capital value) used by the responsible organization for property taxation?</p>	<p>The value type is based on the market value, a percentage of which is adopted by the cadastral authorities to define the taxable base (or cadastral valuation) as well as the property tax.</p>
<p>4. Please mention the public registry datasets (e.g. cadastre, land registry, building registry) which are used in valuation procedures, and their mutual functions?</p>	<p>The public registry datasets used in valuation are set and managed by the cadastre. Typically, cadastral datasets are based on land parcels and contain updated physical data about the geometry, location, topographic characteristics and availability of public services infrastructure, all of which is processed to define physical and economic homogenous zoning. For buildings, the datasets include variables such as built area, architecture type, construction materials and structure and conservation condition. Building value models result from the combination of those variables. These property datasets are the inputs for the value calculation models. Registry datasets are less often used for valuation purposes as the transaction values are often under-registered by the parts in order to reduce taxes on sales and notary expenses.</p>

<p>5. Which methods are applied for collecting market data needed for valuation?</p>	<p>The collection methods rest on data gathered from market offers and transactions as the main source, and from internet and newspapers ads. Single property valuations (commercial appraisals) and surveys experts are also used as collecting methods and sources for valuation.</p>
<p>6. Is there any special valuation database for storing datasets <i>used in</i> (e.g. property characteristics) or <i>produced with</i> (e.g. sales statistics) valuation procedures? If yes, please give the name of database, indicate responsible authority, and describe its content.</p>	<p>There are real estate sales and leasing administration portals which also serve as valuation database sources for the consolidation of the market studies and property appraisals. They are developed and maintained by private firms as well as by constructors' chambers. Some private portals generate statistical studies on property values.</p>
<p>7. Is there a web-based dissemination of valuation information? If yes, please indicate which data (e.g. sales statistics) is open to the public.</p>	<p>No. There is none web-based dissemination of valuation info; although some public organizations collect and publish real estate "Reference Values" which can be openly accessed through the internet.</p> <p>See for instance the following site: <a href="http://mapabogota.gov.co/tematicas/catastro/valor_de_referencia_terreno_(m2)">mapabogota.gov.co/tematicas/catastro/valor de referencia terreno (m2)</a></p>
<p>8. How frequently are general revaluations made?</p>	<p>The decentralized cadastrals (Bogotá, Cali and Medellín) periodically update their cadastral values (usually each year). Values in the Antioquia and IGAC's cadastrals are generally updated.</p>
<p>9. Is there a system of indexation affecting property value between regular revaluations?</p>	<p>Yes. The IVP - Property Valuation Index (Indice de Valoración Predial) and IVIUR (Indice de Valorización Inmobiliaria Urbana y Rural- Urban and Rural Real Estate Valuation Index used In Bogotá), annually update the commercial value for properties that are not included within the regular cadastral processes.</p> <p>For the rural sector, the Producer Price Index (Indice de Precios al Productor) produced by the Statistical Institute (DANE) is used to adjust land values in the agricultural sector.</p> <p>See <a href="http://www.dane.gov.co">www.dane.gov.co</a></p>
<p>10. Do taxpayers have a right to appeal against the appraised values? If yes, please indicate how disputes are resolved.</p>	<p>Yes, according to the Law, taxpayers can appeal the results of the cadastral assessment, requesting the cadastral authority to review the appraisal. Taxpayers can usually attach evidence that shows the values assigned by the cadaster do not conform with the conditions of their properties.</p> <p>If the review of the cadastral authority proves that there is an error, the cadastral valuation as well as the property tax are thereby modified.</p>

Please continue with Section B, if mass appraisal procedures are applied in your country for immovable property taxation. If single property appraisal methods are used -even if as complementary part of mass appraisal, please answer questions given in Section C.

### Section B - Questions for mass appraisal procedures in Colombia

Questions	Responses
1. Do you have a (computer aided) mass appraisal system in your country? If yes, please indicate also responsible authorities.	In general, cadastral authorities use technological tools for mass valuation which include Spatial analysis models for land valuation and econometric models for building's valuation. No automated modern mass appraisal has yet been introduced.
2. Is there any other use of the mass appraisal system than property taxation?	Yes. Mass valuation methodologies have also been applied for road, energy and hydrocarbon pipes' infrastructure development projects.
3. Which CAD/GIS/CAMA (Computer-aided design / Geographic information system / Computer Assisted Mass Appraisal) software packages are used in mass appraisal?	ArcGIS, AutoCAD, MapInfo, QGis, Gvsig, Erdas and econometric analysis programs and models.
4. Which geographical or spatial datasets are used in mass appraisal? Please describe the source of these datasets.	<ol style="list-style-type: none"> <li>1. Standard of land use, taken from Land Management Plans (POT – Planes de Ordenamiento Territorial).</li> <li>2. Homogeneous Areas of Land, a study prepared by the Department of Agrology of IGAC - Agustín Codazzi Geographic Institute – (Instituto Geográfico Agustín Codazzi). (For rural studies).</li> <li>3. In some cases Digital Terrain Models (DTM).</li> <li>4. Physical variables such as roads, water availability, public services, current land use, are collected in field work.</li> <li>5. In Bogota there is the Cadastral Real Estate Observatory (OIC – Observatorio Inmobiliario Catastral), as a source for market data.</li> </ol>
5. Which geographic or spatial analysis methods (e.g. visibility analysis, proximity analysis) are applied in mass appraisal?	Mainly zoning and spatial analysis models based on Homogeneous Physical and Economic Areas. Classification of the terrain according to physical, normative and use variables are used as variables for spatial analysis methods.
6. Is three-dimensional (3D) data used in mass appraisal? Please describe source of 3D data (e.g. floor plans). Does Valuation objects include condominium, strata title, freehold flats or other 3D units.	<ol style="list-style-type: none"> <li>1. In some cases Digital Terrain Models (DTM).</li> <li>2. Cadastral plans and bases include height information of the constructions, which are part of the econometric models.</li> </ol>
7. Is there any relationship between the CAMA system and other public registers (e.g. cadastre, land registry, building registry, ...)?	I have no knowledge inside all cadastres. I know the economic analysis tools used in Bogotá'cadastre, specifically econometric models, individual valuation analysis applications and Map module to load values.
8. Please describe the statistical models (e.g. additive, multiplicative) applied in mass appraisal according to type or functions of properties?	In general, univariate statistical models are used based on the quantification of the quality of the constructions. Some cadastres show some advances by introducing the application of multivariate econometric models, always used to define the value of constructions or the integral value (land plus construction) of urban real estate
9. Please indicate statistical analysis methods (e.g. multiple regression analysis, artificial neural network) applied in mass appraisal?	In general, regression models and econometric models are used, but specifically applied to constructions.

10. Which land use characteristics (e.g. land use zones) are used as variables in mass appraisal models? Please describe the source(s) of these characteristics.	In traditional methods one of the variables analyzed is the current land use. This is gathered by field work and aerial images interpretation.
11. Which environmental and locational characteristics (e.g. location nuisance, distance to points of interest / POIs, environmental risks) are used as variables in mass appraisal models? Please describe the source(s) of these characteristics.	<p>The traditional models include a variable related to land use regulations established by the territorial norms set on rational use and development policies (in theory). Within them, environmental protection areas and vulnerable ecosystems are clearly identified and their use restricted.</p> <p>The variables determining the land value (location, centrality, fertility, water availability, topographic conditions and buying and selling habits) are also collected, evaluated and incorporated into the value calculations according the Land Rent Theories.</p>
12. Which building or improvement characteristics (e.g. number of unit, construction type and material) are used as variables in mass appraisal models? Please describe the source(s) of these characteristics.	Building qualification questionnaires are used in the field to appraise the buildings' conditions. They evaluate construction' materials, conservation condition and, to a lesser extent, design. This information (translated into numerical values) feeds the regression models from which the building value is estimated. In some cadastres and in the private sector, a construction unit price analysis is used to set building typologies.
13. Does valuation legislation prescribe an investigation into the general quality or performance analysis (e.g. 'ratio study') of the mass appraisal system? If yes, please describe the indicators used in the performance analysis.	The legislation only regulates the basic parameters in the sample size and dispersion measures of the statistical analyzes. However, new proposals are being developed in the pilot plans of the multipurpose cadastre, which should produce a more detailed and precise quality and performance analysis.
14. Please indicate whether single property appraisal is applied for improving accuracy of mass appraisal estimations.	<p>Yes. The conventional methods for single (individual) property appraisals and the use of statistical methods (stratified sampling, expansion factors) are an important part in modelling the values and improving the accuracy of the mass appraisal estimations.</p> <p>On the other hand, single and specific analyzes of the expansion results are made to all properties in order to detect biased or atypical data. This process is known as Sensitivity Analysis of the estimations.</p>

### Section C. Questions for single property valuation procedures in Colombia

Questions	Responses
1. Which valuation methods are used for single property appraisal for property taxation? Please relate valuation methods with the type of valuation objects (e.g. sales comparison approach for unimproved parcels).	The Colombian legislation presents the following individual valuation methods: Comparative method, cost method (replacement), income method and residual (technical) method. See Resolution 620 of 2008 issued by the Agustín Codazzi Geographic Institute – IGAC. (Instituto Geográfico Agustín Codazzi)
2. Which geographical or spatial datasets are used for single property appraisal? Please describe the source(s) of these datasets.	<p>The cartography and supporting documents of the land use plans (POT) are used to define the land use regulations.</p> <p>It is common for appraisers to take as source the areas of legal registration documents, construction licenses and,</p>

	<p>when supplied by the clients, topographic surveys and titles' analysis. Detailed measurements are made at the field inspection.</p> <p>Long experienced appraisers review the databases produced by the physical component, elaborated in the cadastral processes: Overall maps, areas, age and qualification of buildings and economic destinations. To a lesser extent homogeneous areas of land (for rural areas) and in some cases digital terrain models are used.</p>
<p>3. Which legal property characteristics (e.g. property rights) are taken into account for single property appraisal? Please describe also the source of these characteristics.</p>	<p>In the valuation of individual properties, domain restrictions on land are verified since they can affect the normal conditions in an open market, as is it is the case of land reserves for road infrastructure, easements and public utility declarations.</p> <p>These data are identified in legal and registry documents: public deeds and tradition certificates known as <i>certificados de tradición y libertad</i>.</p>
<p>4. Which land use characteristics (e.g. land use zones) are taken into account for single property appraisal? Please describe also the source(s) of these characteristics.</p>	<p>The economic activity that develops in the individual property is evaluated in the general context of regional land use characteristics in order to observe the coherence with its surroundings as well as the observation of the land property and use regulations. It allows the cadastral system to identify land use conflicts (too frequent), where certain activities are not allowed by the planning authorities in the Territorial Planning norms. (POT-Planes de Ordenamiento Territorial).</p> <p>Several characteristics are identified in rural lands field works: dominant and complementary land uses, specific economic activities (assessed by use typologies and degrees of intervention), the use of technical or technological processes in raising crops and livestock, or the assessment of potential for mechanization or urbanization.</p> <p>In urban areas, in field works main and secondary economic activities and uses, level and intensity of the intervention, amongst other, are the main characteristics identified.</p>
<p>5. Which environmental and locational characteristics (e.g. location nuisance, distance to POIs, environmental risks) are taken into account for single property appraisal? Please describe the source(s) of these characteristics.</p>	<p>The environmental characteristics are quite relevant in the single property appraisal and valuation given the responsibilities and restrictions of use set identified by the planning authorities in the Territorial Plans: Main ecological structure, water reserves, water bodies protection zones, national natural parks, integrated management districts, among others.</p> <p>As for locational variables, it is well known that the formation of land prices is associated with the capacity to generate rent and the conditions of centrality and accessibility are decisive in the formation of land prices so much so that they are considered as the most important variables in economic analysis. Some appraisers formulate regression models based on distances to consumption and collection centers, as well as on the</p>

	availability and quality of road infrastructure, as part of the land value formation models.
6. Which building or improvement characteristics (e.g. number of unit, construction type and material) are taken into account for single property appraisal? Please describe the source(s) of these characteristics.	<p>Cadastral authorities in charge of mass valuation process, use the building qualification form, which evaluates materials, conservation condition and, to a lesser extent, design. This variables feed, the regression models..</p> <p>In the private sector, unit values are used by building typologies, either formulated by the appraiser or taken from magazines and specialized publications in the construction sector.</p>
7. If there is a special valuation database, please indicate which sales comparison method related data (e.g. comparable property identifiers, monetary adjustment for time, physical differences) are kept in this database.	I am familiar with the applications for economic analysis applications used in the Bogotá and Cali Cadastre (FOCA) as well as some projects carried out by IGAC (In fact, I led the design of the economic analysis application and the Geographic Information System of the Project Appraisal Index – IVP or Índice de Valoración Predial), where statistical processes include the debugging (analysis) of real estate market, the calculation of buildings depreciation, and calculation and analysis of <i>integral value</i> appraisals.
8. If there is a special valuation database, please indicate which cost method related data (e.g. type and source of cost price, chronological age, depreciations) are kept in this database.	. I am familiar with the applications for economic analysis applications used in the Bogotá and Cali Cadastre (FOCA) as well as some projects carried out by IGAC (In fact, I led the design of the economic analysis application and the Geographic Information System of the Project Appraisal Index – IVP or Índice de Valoración Predial), where statistical processes are carried out, debugging (analysis) of real estate market, buildings depreciation, and calculation and analysis of total and integral value appraisals.
9. If there is a special valuation database, please indicate which income valuation method related (e.g. gross income, net income, capitalization rate, discount rate) are kept in this database.	I do not know about the existence of such tools in the country.

**Section D. Information concerning respondent(s)**

<b>Questions X..Y</b> have been answered by	<b>Respondent</b>
1. Name	Dagoberto Robayo Gutiérrez
2. Affiliation / position	Líder Componente Económico Proyecto Catastro Multipropósito – Departamento Nacional de Planeación. DNP
3. Country	Colombia (South America)
4. E-mail	drobayo@dnpp.gov.co
5. Comments	The answers are given according to the knowledge of the functioning of the cadastre. It is possible that there are technological advances of which I am not aware; If necessary we could inquire into the interior of these entities.

<b>Questions Z..A</b> have been answered by	<b>Respondent</b>
1. Name	Dagoberto Robayo Gutiérrez
2. Affiliation / position	Líder Componente Económico Proyecto Catastro Multipropósito – Departamento Nacional de Planeación. DNP
3. Country	Colombia (South America)
4. E-mail	drobayo@dnpp.gov.co
5. Comments	The answers are given according to the knowledge of the functioning of the cadastre. It is possible that there are technological advances of which I am not aware; If necessary we could inquire into the interior of these entities.