

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges, and Opportunities

Maria FLOREZ, Daniel CASALPRIM, Ivan CARRILLO, Colombia

Key words: online education, hybrid modality, professional development, lifelong learning, training strategy

SUMMARY

As a result of the Land Administration System (LAS) public policy being implemented in Colombia, the SwissTierras project and its partners designed a national training strategy that will impact approximately 50,000 Colombians. During 2020 and 2021, the strategic initiatives to improve the skills of those involved in land information management were designed and validated. These initiatives improve the training activities that started in 2015 when the Swiss Cooperation began providing support to Colombia.

The strategic initiatives are based on some frameworks of reference and include a series of projects that aim to: a) positioning the LAS to raise stakeholders' awareness of the design and update of training activities; b) expanding LAS training programs offer with a regional and differential approach, including the training of national experts to improve the academic offer at the formal, non-formal (Education for Work and Human Development - ETDH in Spanish), and informal education levels; c) creating added value in LAS training programs aligned with the land administration national authorities, educational innovation factors, as well as student retention, success and continuity; d) mitigating tensions and disputes between academia, LAS stakeholders, the Colombian government, and the overall community in order to achieve shared goals for policy implementation; and e) transferring LAS knowledge that is gathered in Colombia to other arenas by venturing into financial benefits for those who create the training programs content.

Implementing the above-mentioned strategic initiatives requires participation of LAS key stakeholders and decision makers from the formal, ETDH and informal education levels in Colombia. Regardless of individual interests, developing public policy requires that people can move more easily between training institutions and the job market in LAS economic sectors; therefore, the governance of LAS training is directly related to the National Qualifications Framework (MNC in Spanish) as part of the National Qualifications System (SNC in Spanish), which was created by the 2018-2022 National Development Plan.

This paper will explain the progress that has been made by SwissTierras and the Colombian government in implementing the education strategy which was created based on the 2020 study phase of human capital gaps in Colombia to implement the LAS. Opportunities and challenges will also be presented. Some of the results from the strategy implementation that have already been identified are a) in the formal education level: collaboration with Los Andes University; in ETDH (non-formal): alliance with SENA (National Training Service,);

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

in informal education: the hybrid training model developed by SwissTierras Colombia for those in charge of implementing the new public policy.

LAS training has brought opportunities and challenges such as governance, budget allocation, modernization of academic portfolios, as well as the time needed to roll out and implement this public policy. Most importantly, lifelong learning, as the core of modern education, is the main challenge of the LAS training strategy.

RESUMEN

Como resultado de la implementación de la política pública del Sistema de Administración del territorio (SAT) en Colombia, el proyecto SwissTierras y sus socios han diseñado una estrategia nacional de formación que impactará alrededor de 50.000 colombianos. Durante los años 2020 y 2021, se diseñaron y validaron los cursos de acción estratégicos necesarios para mejorar las capacidades del talento humano necesario para lograr la gestión de la información territorial, los cuales, recogen las actividades de capacitación desarrolladas desde el año 2015 cuando la Cooperación Suiza inicio su apoyo en Colombia.

Las recomendaciones responden al marco de referencia de la estrategia e incluyen proyectos destinados a: a) el posicionamiento del SAT para lograr sensibilizar los actores de interés en el diseño y actualización de acciones formativas; b) ampliar la cobertura de los programas del SAT con enfoque regional y diferencial por nivel educativo con la preparación de expertos nacionales que puedan mejorar la oferta académica a nivel de educación formal, no formal (Educación para el Trabajo y el Desarrollo Humano -ETDH-) e informal; c) crear nuevo valor en los programas en alineación con el ecosistema nacional, la innovación educativa y la permanencia y éxito estudiantil son los pilares del programa para crear nuevo valor en los programas del SAT; d) conciliar tensiones y dilemas entre la academia, el sector empleador del SAT, el gobierno nacional y la sociedad civil para lograr objetivos comunes en la implementación de la política; y e) exportar el conocimiento generado en Colombia a otras arenas incursionando en esquemas de monetización para los autores de contenido.

La implementación de la estrategia requiere de la participación de los actores clave en el sector del SAT y en el sector de la educación en Colombia. Más allá del interés de cada actor, el desarrollo de la política pública implica el binomio formación-trabajo, por lo tanto, la gobernanza de la formación del SAT está relacionada directamente con el Marco Nacional de Cualificaciones (MNC) que hace parte del Sistema Nacional de Cualificaciones (SNC), creado en el Plan Nacional de Desarrollo 2018-2022 “Pacto por Colombia, pacto por la equidad”.

Este artículo presenta tanto los resultados, oportunidades y desafíos en la implementación de la estrategia, como consecuencia de un diagnóstico realizado en el año 2020 para determinar las brechas de capital humano en el SAT. A nivel de educación formal, principalmente con el apoyo dado a la Universidad de Los Andes; en ETDH, con la alineación de trabajo con el

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

SENA; y a nivel de educación informal con la oferta de formación híbrida del proyecto SwissTierras Colombia dirigida a las autoridades nacionales y territoriales del SAT.

La formación del SAT trae consigo oportunidades y retos asociados a la gobernanza, asignación de presupuesto y modernización del portafolio académico de las instituciones educativas junto con en el tiempo requerido para desplegar las definiciones de la política pública en Colombia. El aprendizaje para toda la vida es la premisa de la educación moderna, por lo tanto, se constituye en el principal desafío de la estrategia formativa en el SAT.

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges, and Opportunities

Maria FLOREZ, Daniel CASALPRIM, Ivan CARRILLO, Colombia

1. INTRODUCTION

Defining Colombia's public policy by creating a strategy for improving governance in the Land Administration System (LAS) established the need to strengthen the capacities of those involved in managing land information, given the limited availability of human resources to support land administration in most parts of the country (DNP, 2020, p. 39). The SwissTierras Colombia project and the national government—represented in the six national partners work together to close gaps in human capital and promote LAS knowledge management.

The partners of the SwissTierras Colombia project are LAS authorities in Colombia and act in accordance with its institutional mission. The entities are the National Planning Department (DNP, as per its acronym in Spanish), the Superintendence of Notaries and Registries (SNR), the Agustín Codazzi Geographic Institute (IGAC, as per its acronym in Spanish), the National Land Agency (ANT, as per its acronym in Spanish), the National Department of Statistics (DANE, as per its acronym in Spanish), and the Ministry of Agriculture and Rural Development (MADR, as per its acronym in Spanish).

The national training strategy 2020-2024 impacts three levels of education in Colombia: formal, non-formal (Education for Work and Human Development -EWHD), and informal. Therefore, it requires the participation of other stakeholders, in addition to the cadastral and registry authorities, to achieve the proposed goals. Approximately 50,000 Colombians are expected to be trained at the technical, technological, and professional levels with the participation of the educational authorities and the emerging LAS subsector. The need for qualified personnel to implement the land administration public policy is becoming increasingly noticeable in the processes of cadastral updating, conservation, and dissemination.

For the past seven years, Colombia has received support from the Swiss Cooperation through the Swiss State Secretariat for Economic Affairs (SECO) in implementing two national strengthening projects: a) the Land Administration Modernization project in Colombia 2015-

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

2019, and b) the SwissTierras Colombia project 2020-2024. Both projects have helped Colombia make progress in implementing globally recognized and accepted land policies, strategies, tools, and instruments. Colombia is showing progress in understanding and developing the LAS, which continues to evolve and require support from experts. Consequently, Colombia's educational system must adapt to the needs arising from implementing the public policy, in line with the new conceptual and methodological elements required.

The achievements, challenges, and opportunities related to LAS training are directly related to progress and challenges at the national level regarding the use of geospatial information and regional development agendas, as well as the formulation of national policies for land administration design, management, and maintenance in order to maximize the benefits of the multipurpose cadaster based on the “support, experience, and knowledge of all institutions that ensure the defense of the rights, responsibilities, and restrictions between people and land” (DNP, 2022).

2. THE LAND ADMINISTRATION SYSTEM (LAS) AND TRAINING GOVERNANCE

The Land Administration System (LAS) for Colombia includes the management of public and private real estate, government-owned land, protected areas, communal lands of ethnic groups, and Colombia's cultural and archaeological heritage regarding land, subsoil, and water. Its governance is related to managing the rights, restrictions, and responsibilities that are defined for the land, understanding public and private, national, and regional stakeholders that are part of the system's processes, as well as the cooperation, complementarity, and coordination between them (DNP, 2020, p. 3).

Since the public policy was defined, Colombia has been working to improve LAS governance by empowering the various entities that participate in the land administration value chain in order to achieve the shared objectives of land use, value, tenure, and development based on a deep understanding and detailed outline of each stakeholder's rights, restrictions, and responsibilities for the benefit of Colombian citizens. The process of land modernization has made it possible to strengthen institutions' identities in the LAS subsector, ensuring that new stakeholders, such as cadastral managers and operators, carry out decentralized tasks in accordance with the provisions of Article 79 of Law 1955 of 2019 that align with the scope of the plan for cadastral training, updating, conservation, and dissemination in the regions.

At the same time, since 2018, international partners from governments such as Germany, the Netherlands, the United Kingdom, the United States, and Switzerland—as well as sources of direct funding from the World Bank and the Inter-American Development Bank are participating in the implementation of the multi-purpose cadaster instrument in Colombia in order to systematically and continuously record the physical, legal, and economic information for all properties, which is integrated with information from the real estate registry and other land information systems (DNP, 2022). The interaction of national and international

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

stakeholders in Colombia has enabled the cadastral update to progress by approximately 30% in the country (DNP, 2022).

Parallel to improving LAS governance, the national educational proposal is being consolidated, which requires the leadership of key stakeholders in the subsector who can promote and manage training actions with their counterparts in the education sector, within Colombia's institutional framework. Meanwhile, differential factors such as lifelong learning and the use of information and communication technology (ICT) constitute key elements of modern education that call for planning and implementing programs that provide innovative, diverse, flexible, inclusive, accessible, and contextualized learning opportunities (SwissTierras, 2021).

The national education strategy is proposed as part of the SwissTierras Colombia project, in cooperation with the project partners (DNP, SNR, IGAC, ANT, DANE, MADR), in order to implement the LAS. Each entity has its own strategic direction that allows it to position itself and achieve the institutional management results (SwissTierras, 2021). Recognizing the alignment of initiatives aimed at strengthening human capital and knowledge management within the framework of the public policy's implementation naturally produces a connection between institutional goals at the level of competitive, operational, and managerial opportunities and threats as well as at the vision-mission level with a need for land administration training in Colombia.

Furthermore, it is important to bear in mind that the governance of training in Colombia is based on the National Qualifications Framework (NQF), which has evolved over several decades (Consejo Privado de Competitividad, 2019, p. 1). Its conceptualization and implementation is applicable nationwide, covering all economic sectors, connecting education and training levels, including all occupations, and serving as a benchmark for educational design in Colombia (MEN, 2020). The multi-institutional nature of the NQF required its own governance scheme that could be extended to all of Colombia's economic sectors, including the emerging LAS subsector.

2.1 Strategies Aligned to Human Capital Training and LAS Knowledge Management

Each partner in the SwissTierras Colombia project has a specific purpose that aligns with the strategy's justification, which allows the following synergies to be identified. The MADR works to improve the rural population's living conditions by using a differential approach (Minagricultura, n.d.); the ANT focuses on the property's social function (Land Portal Org., 2015); IGAC serves as the provider of the public cadaster service by default (IGAC, 2020); and the SNR guarantees the preservation of faith and public safety (SNR, n.d.). Moreover, the DNP is the national government's think tank (DNP, n.d.), and DANE is responsible for ensuring the production, availability, and quality of strategic statistical information, as well as for directing, planning, implementing, coordinating, regulating, and evaluating the production and dissemination of basic official information (Congreso de la República, 2015).

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)







Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

Figure 1. Mission of the SwissTierras project's partner LAS authorities

 <p>El campo es de todos Minagricultura</p> <p>Strategic Sector Plan 2019-2022</p> <p>4. Rural Development SO4.1 Improve the rural population's income - Productive capacities and income generation: (...) training processes for the rural population in order to develop their production and marketing knowledge and skills regarding agricultural, aquaculture, fisheries, and forestry products.</p>	 <p>El futuro es de todos DNP Departamento Nacional de Planeación</p> <p>Institutional Strategic Plan 2019-2022</p> <p>1. Strengthen sectors' and regions' technical capacities to promote productivity, competitiveness, sustainability, and equity Information, knowledge, and innovation management; Training for Regional Entities on topics related to municipal performance measurement indicators (MDM, as per its acronym in Spanish) and follow-up of the Territorial Development Plan (PDT, as per its acronym in Spanish) - Offer.</p>	 <p>Agencia Nacional de Tierras</p> <p>National Land Agency (ANT) Strategic Plan 2017-2021</p> <p>5.2 Develop the capacity for stakeholder coordination and impact communications at the ANT: Promote training processes for rural and ethnic communities and regional entities to manage the formalization and regularization of property rights. 5.3 Design and implement an interoperable technological platform that allows the ANT to efficiently manage information, from data quality to information management as well as building a knowledge management culture.</p>
 <p>IGAC INSTITUTO GEOGRÁFICO AGUICEROS</p> <p>Institutional Strategic Plan 2019-2022</p> <p>2. Promote the empowerment of cadastral managers. 4. Expand the regional training offer for the certification of competencies in multipurpose cadastral matters.</p>	 <p>DANE INFORMACIÓN PARA TODOS</p> <p>National Statistical Plan 2020-2022</p> <p>8. Ensuring methodological rigor in official statistics: Train the entities of the National Statistical System (NSS) on statistical norms, guidelines, and standards.</p>	 <p>SNR SUPERINTENDENCIA DE NOTARIADO & REGISTRO</p> <p>Institutional Strategic Plan 2021-2022</p> <p>5. To achieve an Efficient, Effective and Innovative (EE+) Superintendence: Implement training processes through a learning platform.</p>

Source: Prepared by SwissTierras

Each entity's mission makes its scope explicit and highlights the lack of an educational focus in the six LAS authorities in Colombia. Therefore, it is necessary to focus on the details of the strategic direction for 2022 in order to establish lines of work directly related to training in Colombia. In general, although the entities consider training processes aligned with their own institutions, IGAC is directly involved in implementing the land administration public policy through the strategy of "Expanding the regional training offer to certify competencies in cadastral matters with a multipurpose approach" from strategic pillar 2: Promote the empowerment of cadastral managers (IGAC, 2019, p. 25).

At the same time, it was established that the DNP is responsible for the Multipurpose Cadaster Project Procurement Plan, financed with resources from Component 1: Institutional strengthening of Loan Agreement No. 4856/OC-CO, signed with the Inter-American Development Bank (IDB), in order to implement the Multipurpose Cadaster Policy, specifically in the technical and technological programs updated to align with the new land administration in Colombia (DNP, 2021).

Figure 2. Strategic Objectives - SwissTierras Project's Partner LAS Authorities

 <p>El campo es de todos Minagricultura</p> <p>Strategic Sector Plan 2019-2022</p> <p>4. Rural Development SO4.1 Improve the rural population's income - Productive capacities and income generation: (...) training processes for the rural population in order to develop their production and marketing knowledge and skills regarding agricultural, aquaculture, fisheries, and forestry products.</p>	 <p>El futuro es de todos DNP Departamento Nacional de Planeación</p> <p>Institutional Strategic Plan 2019-2022</p> <p>1. Strengthen sectors and regions' technical capacities to promote productivity, competitiveness, sustainability, and equity Information, knowledge, and innovation management; Training for Regional Entities on topics related to municipal performance measurement indicators (MDM, as per its acronym in Spanish) and follow-up of the Territorial Development Plan (PDT, as per its acronym in Spanish) - Offer.</p>	 <p>Agencia Nacional de Tierras</p> <p>National Land Agency (ANT) Strategic Plan 2017-2021</p> <p>5.2 Develop the capacity for stakeholder coordination and impact communications at the ANT: Promote training processes for rural and ethnic communities and regional entities to manage the formalization and regularization of property rights. 5.3 Design and implement an interoperable technological platform that allows the ANT to efficiently manage information, from data quality to information management as well as building a knowledge management culture.</p>
 <p>IGAC INSTITUTO GEOGRÁFICO AGUICEROS</p> <p>Institutional Strategic Plan 2019-2022</p> <p>2. Promote the empowerment of cadastral managers. 4. Expand the regional training offer for the certification of competencies in multipurpose cadastral matters.</p>	 <p>DANE INFORMACIÓN PARA TODOS</p> <p>National Statistical Plan 2020-2022</p> <p>8. Ensuring methodological rigor in official statistics: Train the entities of the National Statistical System (NSS) on statistical norms, guidelines, and standards.</p>	 <p>SNR SUPERINTENDENCIA DE NOTARIADO & REGISTRO</p> <p>Institutional Strategic Plan 2021-2022</p> <p>5. To achieve an Efficient, Effective and Innovative (EE+) Superintendence: Implement training processes through a learning platform.</p>

Source: Prepared by SwissTierras

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

As a result, IGAC and DNP are the national authorities with the greatest affinity in strengthening human capital and knowledge management. Therefore, as experts in the sector, they can be responsible for the governance of LAS training in Colombia and work together with educational authorities at the national level.

2.2 Governance of LAS Training Under the National Qualifications Framework (NQF)

The governance of LAS training mainly involves LAS *government* actors and other stakeholders that impact education and employment in Colombia. In the education sector, national government stakeholders and *educational institutions* are considered strictly regulated and complex organizations that mainly employ traditional operating models. Additionally, land administration *employers* require human capital to efficiently develop abilities and deal with the evolution of land administration public policy. Finally, stakeholders representing Colombian *citizens* are based on the person's sense of belonging to an organized community or society, with rights and duties regarding management of the LAS (SwissTierras, 2021, p. 39).

Figure 3. LAS Collegiate Body



Source: Prepared by SwissTierras

The multi-institutional nature of the NQF—which includes the government sector, academia, the job-creating business sector, and citizens in general—has its own institutional and governance scheme that allows it to be technically, legally, and financially viable in order to ensure its sustainability and coordination with the other components that are also part of the National Qualifications System (NQS) (Consejo Privado de Competitividad, 2019).

The NQF's institutional and governance model includes four levels of intervention to ensure proper functioning:

- a) Policy and Regulatory Level: Organizes the agents who will be responsible for formulating and developing the policy and regulation for implementing, maintaining, and updating the NQF.
- b) Strategic level: Establishes the strategic lines and technical decision-making required to achieve the NQF objectives.

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

- c) Operational level (creation, quality, monitoring, and evaluation of the NQF and qualifications): Manages and operates the design, quality, monitoring, and updating of NQF qualifications and structure.
- d) Implementation level: Ensures the NQF is coordinated with the rest of the NQS components and other relevant external processes.

Colombia is currently facing two situations that require prioritized attention: a) the implementation of the NQF institutional and governance model, which takes time at each of the identified levels, along with defining goals and baselines for measuring results and impact, as well as methodologies for measurement, analysis, and implementation in the institutions in line with the NQF's progressive construction; and b) the ongoing evolution of land administration public policy and the multipurpose cadaster, which requires immediate training governance to organize the stakeholders, determine priorities for action, and manage the coordination between educational agents and LAS employers in order to have sufficient, competent, and trained professionals to support the implementation processes at the cadastral and registry levels.

3. STRENGTHENING HUMAN CAPITAL AND KNOWLEDGE MANAGEMENT AS OF 2020

The Swiss Cooperation has supported the Colombian government in the process of modernizing land administration since 2015 by implementing a project from 2015 to 2019 with the following main objective:

To strengthen the architecture of the land administration system at the national and regional levels through institutional strengthening, proposing best international practices in the technical and technological field, and developing professional capacities required for its implementation at different levels.

To this end, it aims for the following: to implement a modern land administration system that Colombian citizens and land administration entities can benefit from, to contribute to the implementation of the multipurpose cadaster public policy, to strengthen the legal security of land rights, and to improve land use planning, which together provide favorable conditions for economic and land development (Proadmin Tierra, n.d.).

In the area of Intervention 2: Strengthening academic and private sector training to modernize land administration, the project managed to design and develop several short face-to-face courses on concepts of the LADM (Land Administration Domain Model) and the use of tools based on LADM/INTERLIS for operators and national entities. At the same time, the project was managed by the University of Applied Sciences of Northwest Switzerland (Fachhochschule Nordweiz-FHNW) in defining a proposal for an academic program to be implemented with Colombian universities. As a result, during 2019 and 2020, the FHNW, the Universidad Distrital, and the Universidad de Sergio Arboleda designed and implemented an Advanced Studies Course (Certificate of Advanced Study - CAS) (Universidad Sergio Arboleda, 2020).

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

In the year 2016 immersion visits were carried out with approximately 50 staff members from Colombian entities involved within the Swiss LADM model, with the aim of promoting knowledge exchange and encouraging the adoption of the global standard in the country. Simultaneously, the SwissTierras Colombia project supported the project's social entities; educational centers such as SENA (National Training Service), the Colegio Mayor de Antioquia, and the Universidad del Valle; and Cadastral Managers, including those in Medellín, in training and appropriation exercises from the LADM model. The project also participated in institutional and academic events nationwide to share the achievements and challenges related to the national land administration policy.

As a result of the intervention (2015-2019), the governments of Switzerland and Colombia decided to continue cooperation with the SwissTierras Colombia project (2022-2024), which consolidates the work carried out in the previous project to support the LAS's design and implementation through institutional strengthening, which will be achieved by developing three technical assistance components aligned with the policy actions established in CONPES 3958 of 2019. The components of the new project in force in 2021 are: a) institutional strengthening; b) extended technical and technological support at the national and regional levels; and c) strengthening human capital and knowledge management (SwissTierras, 2020).

In the third component, seven short in-person courses were designed and carried out related to an overall summary of the LAS, the use of the Cadaster Registry's extended LADM data models and technological tools, and their application in cadastral surveys. The beneficiaries of the courses up to 2020 were mainly the national authorities—such as IGAC, SNR, ANT, and SENA—as well as some staff members of the Cadastral Managers, recently authorized by IGAC. At the end of the year, more than 50 people from the institutions had been trained (SwissTierras, 2022).

Holding events to disseminate the LADM model—along with generating content for publications in the IGAC Newsletter, the International Journal of Geo-Information, the Pan American Institute of Geography and History, the International Federation of Surveyors 2017, 2018, 2019, and 2020 editions, and the World Bank's annual conference in 2020—served as strategies to make Colombian knowledge management in land administration visible at both the national and international level (SwissTierras, 2022). The generation of knowledge is the result of joint work between national authorities and SwissTierras to promote initiatives to raise awareness of the results achieved throughout the project's implementation.

Despite the work carried out by SwissTierras Colombia, the LAS authorities, and the academic and research sector to improve the capacities of those responsible for public policy implementation in Colombia, it was necessary to structure a gradual national educational strategy to boost human capital in the LAS for the years 2020-2024 due to the results of a diagnostic study which showed gaps in the quantity, quality, and relevance of human capital available in Colombia.

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

The strategy includes five lines of work:

- a) Position the LAS to raise awareness among stakeholders regarding the design and updating of training activities.
- b) Expand the coverage of LAS programs with a regional focus, differentiated by educational level, by training national experts who can improve the academic offer at the formal, non-formal (EWH), and informal education levels.
- c) Create new value on the programs in alignment with the national ecosystem, educational innovation, and student retention and success, which are the LAS program pillars.
- d) Reconcile tensions and conflicts between academia, the LAS employer sector, the national government, and civil society to achieve shared objectives regarding policy implementation.
- e) Export the knowledge generated in Colombia to other arenas by venturing into monetization schemes for content authors.

4. RESULTS, CHALLENGES, AND OPPORTUNITIES OF SWISSTIERRAS TRAINING 2021-2024

The strategy's development and implementation involves joint work among the SwissTierras Colombia project partners and Colombia's key stakeholders in education at all levels of training. In 2021, nearly 17 educational institutions were interested in participating in the strategy as visible stakeholders, and 27 key players in the LAS sector participated in the SwissTierras Colombia training courses. As a result, approximately 2,000 Colombians from different regions of the country were trained.

Table 1. Logical Framework Indicators for the SwissTierras Colombia Project

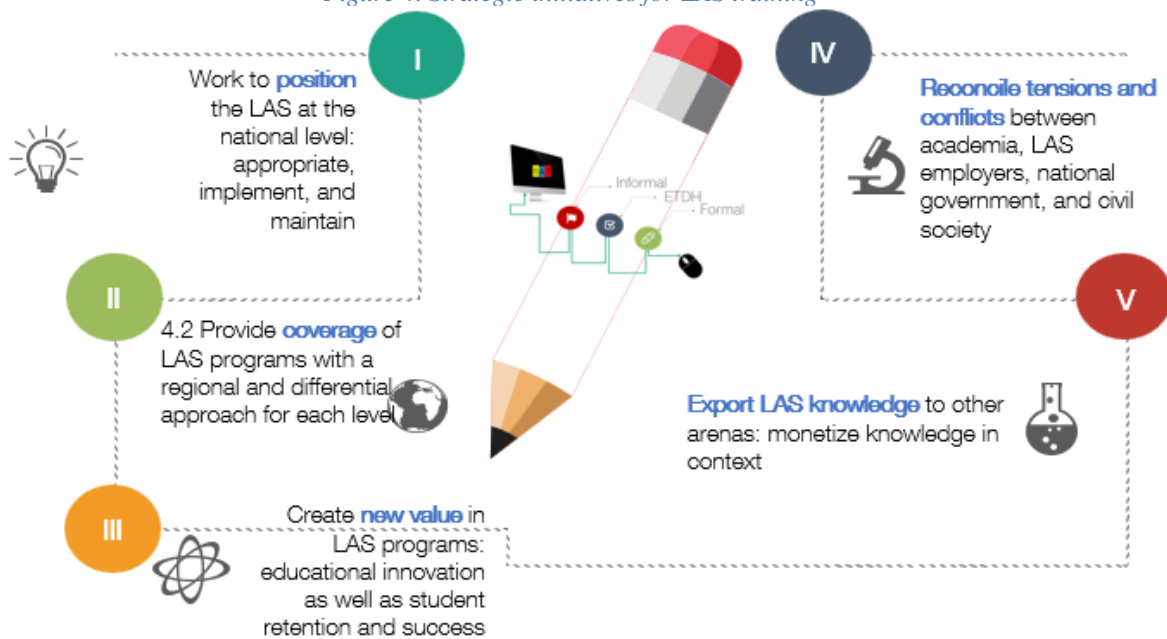
COMPONENT #3 INDICATORS	2021
Short awareness-raising and training courses	112
Entities trained	27
People trained	2,000
Number of different courses	13
Satisfaction rate in courses	90%

Source: 2021 Annual Report (SwissTierras, 2022, p. 9)

The strengthening human capital and knowledge management indicators more than doubled the goal set by the project partners, given the participants' high level of interest in implementing the multipurpose cadaster public policy, keeping it up-to-date, and learning about the origin, progress, and challenges of the LADM-COL model. At the same time, the

work team is carrying out actions to implement the strategic guidelines in conjunction with educational agents throughout Colombia.

Figure 4. Strategic initiatives for LAS training



Source: Prepared by SwissTierras

4.1 Positioning LAS at the National Level

A program named “Involving those who impact LAS” aims to train the trainers. In 2021 and 2022, it has facilitated the training of academic teams at Higher Education Institutions (IES, as per its acronym in Spanish) located throughout Colombia, including the Universidad del Valle, the School of Military Engineers, the Universidad del Cauca, Universidad Distrital, and SENA. The challenge is to continue working hand in hand with academia to ensure that teachers and academic managers are aware of advances in public policy and are updating programs and syllabi related to the LAS areas of knowledge accordingly.

At the same time, actions have been carried out to generate knowledge through presentations at national and international events, in which national authorities such as DNP and DANE have participated, as well as IES, such as the Universidad Distrital, Universidad Santo Tomás, Universidad de Los Andes, Colegio Mayor de Antioquia, the School of Military Engineers, the Alexander von Humboldt University Business Corporation, and the Huila University Corporation. At the international level, events have been held with the Military Geographical Institute of Bolivia and the 2021 edition of the International Federation of Surveyors.

The national and international events held in 2021 and 2022 have attracted more than 1,800 attendees. The challenge is to involve more stakeholders interested in the LAS public policy and its progress, as well as create a new educational offer for an employer sector that

currently includes 34 cadastral managers authorized by IGAC with their respective operators (DNP, 2022).

4.2 LAS Programs Coverage with a Regional and Differential Approach by Educational Level

The strategic course to improve LAS programs coverage with a regional focus, differentiated by educational level, includes four programs:

- a. The program named “Training experts in the LAS in Colombia” requires educational institutions in the country to expand their program offerings to meet the needs of public policy implementation. Between 2021 and 2022, two 120-hour diploma courses have been updated, both as part of the continuing education offer at the Universidad del Valle and Universidad de Los Andes. At the same time, support sessions were held for the Land Administration course in Colombia, which took a technical approach to the multipurpose cadaster, guided by the Universidad Distrital (SwissTierras, 2022).
- b. The “Strengthening Higher Education” program includes actions related to professional and technical internships as a degree requirement for students in academic programs related to the LAS. This has allowed SwissTierras to hire two interns who, upon joining the workforce, had the opportunity to learn from experts about defining different types of databases for the LADM-COL model and creating content for a course on the new cartographic projection in Colombia. Both interns are active in the labor market as highly-qualified human capital.

In this strategic course, it is a challenge to establish projects to strengthen the LAS in postgraduate studies through research. The design, implementation, and maintenance of research projects (applied or that push the frontier of knowledge) requires a budget to provide human and technological resources at each stage. However, the Universidad del Cauca is having discussions with the University of Glasgow to develop a joint initiative on geospatial data management, which would allow them to access international funding.

- c. SENA (the National Training Service) is the main stakeholder in the program “Strengthening Education for Work and Human Development (EWHI).” We work with this sector leader to implement training focused on the LADM-COL model for SENA trainers who are part of the infrastructure and construction network, as they are directly related to cadastral cartography, which must be updated in accordance with public policy (SENA, 2022). As part of SENA’s operation, programs are created and updated through a Labor Competency Standards (LCS) protocol derived from the economic sector’s manifest needs, while the multi-institutional nature of the LAS has delayed the process. The challenge lies in developing the necessary inputs to establish

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

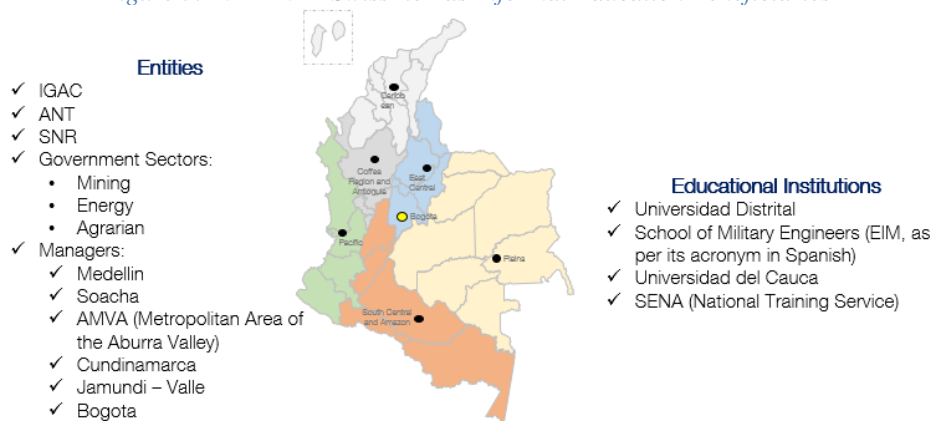
Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

the LCS (new or updated) prior to creating professional training at a technical, labor, or technological level that is relevant to developing the LAS subsector. Despite this challenge, as a first step in 2021, the DNP commissioned a study of occupational profiles that will be available in May 2022.

- d. The program “Strengthening Secondary Education” brings with it the challenge of achieving synergies with stakeholders at this level of education in order offer more training during high school to ensure that students become part of a skilled labor force for the LAS. The process of coordinating with vocational secondary education—combined with propaedeutic cycles between schools and universities as work tools between educational levels—provides an academic-administrative work protocol with long-term results. However, since 2020, support for the Universidad Sur Colombiana in coordinating with schools in the Huila region has been planned in order to develop the topographic engineering program.
- e. The program “Strengthening Informal Education” presents the greatest number of visible results, with more than 2,000 students in short-term programs offered by SwissTierras Colombia to benefit national authorities, regional entities, and educational institutions.

Figure 5. 2021-2022 SwissTierras Informal Education Beneficiaries



Source: Prepared by SwissTierras.

The SwissTierras Colombia courses portfolio includes a virtual option through the online learning management system (LMS) with eight self-paced courses that provide certification once activities have been completed. The courses are available free of charge to any Spanish speaker interested in LAS topics at <https://cursos.swisstierrascolombia.com>. Additionally, hybrid courses—which include online (asynchronous) courses and synchronous meetings scheduled with the teachers who designed them, in order to review the course syllabus and answer any questions regarding the LAMD-COL model’s application—have enabled approximately 400 people to receive training in the last two years.

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

Table 2. Logical Framework Indicators for the SwissTierras Colombia Project

COMPONENT #3 INDICATORS	Results as of March 2022*
Short awareness-raising and training courses	125
Entities trained	31
People trained	2,679
Number of different courses	14
Satisfaction rate in courses	90%

**Preliminary Information at the End of the First Quarter 2022*

Source: Prepared by SwissTierras

4.3 Creating New Value in LAS Programs

The strategic course creating new value in the LAS programs—through the “Educational innovation in the LAS” program—allowed SwissTierras Colombia and the Universidad de Los Andes to jointly design a diploma course in multipurpose cadaster and land use planning in Colombia, aimed at managerial and technical interest groups. Both focuses of the diploma course are part of the Universidad de los Andes’s macro and micro credentials model and provide certifications that recognize the competence achieved within the framework of a training process, subject to compliance with applicable requirements (UniAndez, n.d.).

The program with a managerial focus will be approved as an elective or concentration in the Land Use Planning and Management (LUPM) specialization and in the Master's Degree in Urban and Regional Planning (MPUR, as per its acronym in Spanish). The program with a technical focus concentrates on the cadaster’s technical aspects and its coordination with planning instruments. Although the university offers the course as a diploma certification course, it does not count towards the academic credit system of any other academic program (UniAndes, 2021). For the first edition of the certification course, SwissTierras Colombia project consultants will participate as head professors, in conjunction with the Consultancy, Auditing, and Construction (ENINCO S.A.), the Colombian Association of Cadastral and Geodesta Engineers (ACICG, as per its acronym in Spanish), and the professors of the Interdisciplinary Center for Development Studies (CIDER, as per its acronym in Spanish), who are responsible for continuing education at the Universidad de los Andes.

The strategic initiatives to a) reconcile tensions and conflicts between LAS training stakeholders and b) export knowledge of the LAS to other arenas will soon show results, since they require a national LAS authority to manage training and be the representative when meeting with national education authorities. Although efforts have been made to align with stakeholders from the NQF, SENA, regional and national higher education institutions and universities, the Pacific Environmental Research Institute, and research groups recognized by Colciencias, efforts to implement strategic initiatives require human, physical, and technological resources that call for a larger budget than what is available as part of the

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

institutions' current financial resources used in operations. Therefore, these initiatives will deliver results in the long term, once the required conditions can be met at a national and sectoral level, due to progress in the Land Administration System policy.

5. CONCLUSIONS

The Land Administration System (LAS) in Colombia is making rapid progress in strengthening the institutions that govern and manage it in accordance with international land administration standards. At this time, Colombia is aware of the need to define LADM-COL data models at both the national and regional levels. Therefore, the need for qualified professionals who can meet the growth challenges has become more evident. International cooperation technically and financially supports the process of national modernization, thereby increasing the demand for LAS-related occupations at the managerial, tactical, and operational levels.

Colombia, its institutions, and new LAS stakeholders require qualified professionals to implement the policies, strategies, instruments, and tools related to land administration. Consequently, gaps in quantity, quality, and relevance of qualified professionals throughout Colombia must be closed. The gradual national educational strategy to boost human capital in the LAS, together with its programs and projects, are the fundamentals for regulating the LAS training plan as a driver for the modernization of land administration in Colombia; this standardization is carried out by the national authority governing education, employability, and the LAS public policy itself.

Between 2015 and 2020, the third component of the SwissTierras project resulted in the development of training actions for national entities regarding land administration decentralization models and LADM-COL data models and tools within the framework of national regulations. It was necessary to define guidelines involving stakeholders in the educational field at their formal, non-formal (EWHF), and informal levels to consolidate a joint line of work that, in addition to adding individual efforts, allows for a clear roadmap with areas of intervention and expected results within defined deadlines. The adoption of the training strategy is considered a key success factor for the design, implementation, and maintenance of the land administration policy. The challenge is to make a national authority in the LAS to assume leadership of programs and projects aimed at boosting human capital and knowledge management and prioritize them aligned with the public policy in Colombia.

Beyond achieving a greater number of people trained in modern land administration topics at varying levels of education in Colombia, the main challenges and opportunities of LAS training are directly related to the quality of training and its impact on people as lifelong training, which implies choices for personal and professional growth. In order to highlight land administration's employability as an emerging sector in Colombia, efforts should be made to align it with decent employment, which dignifies and allows for one's own capacities to be developed, with respect for fundamental labor principles and rights, with a fair income

proportional to the effort made, without gender-based or any other kind of discrimination, with social protection, and that includes social dialogue and tripartism (OIT, 2004).

REFERENCES

- Congreso de Colombia. (05-25-2019). *Ley 1995 Plan Nacional de Desarrollo 2018-2022 "Pacto por Colombia, Pacto por la Equidad (Law 1995 2018-2022 National Development Plan "Pact for Colombia, Pact for Equality)*. Retrieved from <https://www.funcionpublica.gov.co/eva/gestornormativo/norma.php?i=93970>
- Congreso de la República. (05-28-2015). *Decreto Ley 1170 de 2015 (Decree Law 1170 of 2015)*. Retrieved from Decreto reglamentario único del sector Administrativo de Información Estadística: <https://www.suin-juriscol.gov.co/viewDocument.asp?ruta=Decretos/30019872>
- Consejo Privado de Competitividad. (2019). *Modelo de institucionalidad y gobernanza del Marco Nacional de Cualificaciones (Instiutional and Governance Model from the National Qualifications Framework)*. Bogotá: Swisscontact.
- DANE. (n.d.). *Generalidades (General Information)*. Retrieved from Departamento Administrativo Nacional de Estadística: <https://www.dane.gov.co/index.php/acerca-del-dane/informacion-institucional/generalidades>
- DNP. (06-13-2016). *CONPES 3859*. Retrieved from <https://www.dnp.gov.co/CONPES/documentos-conpes/Paginas/documentos-conpes.aspx>
- DNP. (11-26-2018). *CONPES 3951*. Retrieved from <https://www.dnp.gov.co/CONPES/documentos-conpes/Paginas/documentos-conpes.aspx>
- DNP. (03-26-2019). *CONPES 3958*. Retrieved from <https://www.dnp.gov.co/CONPES/documentos-conpes/Paginas/documentos-conpes.aspx>
- DNP. (10-26-2020). *CONPES 4007 - Estrategia para el fortalecimiento de la gobernanza del Sistema de Administración del Territorio (Strategy for strengthening the governance of the Land Administration System)*. Retrieved from <https://www.dnp.gov.co/CONPES/documentos-conpes/Paginas/documentos-conpes.aspx>
- DNP. (10-26-2020). *CONPES 4007 - Estrategia para el fortalecimiento de la gobernanza del Sistema de Administración del Territorio (Strategy for strengthening the governance of the Land Administration System)*. Retrieved from

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

<https://www.dnp.gov.co/CONPES/documentos-conpes/Paginas/documentos-conpes.aspx>

- DNP. (08-17-2021). Términos de Referencia - Caracterización de brechas de capital humano en Colombia para la gestión catastral (Terms of Reference - Characterization of gaps in human capital in Colombia for cadastral management). Bogotá.
- DNP. (02-28-2022). *Catastro Multipropósito (Multipurpose Cadaster)*. Retrieved from Catastro Multipropósito: <https://catastromultiproposito.dnp.gov.co/acerca-de/Paginas/que-es-el-catastro-multiproposito.aspx>
- DNP. (01-20-2022). *Indicador: Porcentaje de implementación del Sistema Nacional de Información de Catastro Multipropósito (Indicator: Percentage of implementation of the National Information System of the Multipurpose Cadaster)*. Retrieved from Sinergia iniciando con evidencia: <https://sinergiapp.dnp.gov.co/#IndicadorProgEnt/33/1160/5509>
- DNP. (n.d.). *Misión, Visión y Origen (Mission, Vision, and Origin)*. Retrieved from Departamento Nacional de Planeación: <https://www.dnp.gov.co/la-entidad/misi%C3%B3n-visi%C3%B3n-origen>
- IGAC. (2019). Plan Estratégico Institucional 2019-2022 (2018-2022 Institutional Strategic Plan). Bogotá.
- IGAC. (08-31-2020). *Misión y Visión (Mission and Vision)*. Retrieved from Instituto Geográfico Agustín Codazzi: <https://www.igac.gov.co/es/contenido/mision-y-vision>
- Land Portal Org. (12-07-2015). *Agencia Nacional de Tierras (National Land Agency)*. Retrieved from Land Portal: <https://landportal.org/es/organization/agencia-nacional-de-tierras-colombia>
- MEN. (2020). *Marco Nacional de Cualificaciones (MNC) (National Qualifications Framework (NQF))*. Bogotá: MEN.
- Minagricultura. (n.d.). *Misión y Visión (Mission and Vision)*. Retrieved from Ministerio de Agricultura: <https://www.minagricultura.gov.co/ministerio/quienes-somos/Paginas/Quienes-somos.aspx>
- OIT. (08-09-2004). *¿Qué es el trabajo decente? (What is decent work?)* Retrieved from Organización Internacional del Trabajo: https://www.ilo.org/americas/sala-de-prensa/WCMS_LIM_653_SP/lang--es/index.htm
- Proadmin Tierra. (n.d.). *Objetivo global del proyecto (Global project objective)*. Retrieved from Proadmin Tierra: <https://www.proadmintierra.info/proyecto-3/objetivo-global-del-proyecto/>

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)

Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022

Volunteering for the future - Geospatial excellence for a better living

Warsaw, Poland, 11–15 September 2022

- SENA. (03-15-2022). Propuesta de Memorando de Entendimiento SENA - SwissTierras Colombia (Proposed Memorandum of Understanding SENA - SwissTierras Colombia). *Legal document under review*. Bogotá, Colombia.
- SNR. (n.d.). *Entidad*. Retrieved from Superintendencia de Notariado y Registro: <https://www.supernotariado.gov.co/transparencia/entidad/mision-y-vision/>
- SwissTierras . (03-15-2021). *Formación SwissTierras Colombia*. Retrieved from SwissTierras Colombia: <https://formacion.swisstierrascolombia.com/wp-content/uploads/2021/09/Propuesta-Estrategia-para-el-Fortalecimiento-del-Capital-Humano-del-SAT-V3-1.pdf>
- SwissTierras. (06-10-2020). *El proyecto*. Retrieved from SwissTierras Colombia: <https://www.swisstierrascolombia.com/proyecto-swisstierras/>
- SwissTierras. (03-15-2021). *Estrategia*. Retrieved from Formación SwissTierras Colombia: <https://formacion.swisstierrascolombia.com/wp-content/uploads/2021/09/Propuesta-Estrategia-para-el-Fortalecimiento-del-Capital-Humano-del-SAT-V3-1.pdf>
- SwissTierras. (02-17-2022). Comité Técnico #11 - Proyecto SwissTierras Colombia. Bogotá.
- SwissTierras. (02-10-2022). *Eventos*. Retrieved from Formación SwissTierras Colombia: <https://formacion.swisstierrascolombia.com/eventos/#internacionales>
- UniAndes. (2021). *Curso virtual: Catastro Multipropósito y Planificación Territorial en Colombia*. Bogotá: CIDER.
- UniAndes. (n.d.). *¿Qué son la macro y microcredenciales Uniandes?* Retrieved from Universidad de los Andes - Educación Continua: <https://educacioncontinua.uniandes.edu.co/es/programas/macro-y-microcredenciales>
- Universidad Sergio Arboleda. (10-30-2020). *Diplomado y Certificado de Estudios Avanzados (CAS) en Administración de Tierras en Colombia en el marco de la Política Pública*. Retrieved from Universidad Sergio Arboleda: <https://www.usergioarboleda.edu.co/educacion-continuada/diplomado-en-estudios-avanzados-cas-en-administracion-de-tierras-en-colombia-en-el-marco-de-la-politica-publica/>

CONTACT INFORMATION

MARIA AMALIA FLOREZ HUERTAS
Proyecto SwissTierras
Av. Dorado No. 69-63 Of. 406
Bogota
Colombia

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)
Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022
Volunteering for the future - Geospatial excellence for a better living
Warsaw, Poland, 11–15 September 2022

+57 317 434 3649
amaliaflorez@gmail.com
<https://swisstierrascolombia.com/>

DANIEL CASALPRIM
Proyecto SwissTierras
Av. Dorado No. 69-63 Of. 406
Bogota
Colombia
+34 638 67 11 56
daniel.casalprim@bsf-swissphoto.com
<https://swisstierrascolombia.com/>

IVAN DARIO CARRILLO DURAN
Departamento Administrativo Nacional de Estadística - DANE
Cra. 59 #26-60
Bogota
Colombia
+57 300 329 3875
idcarrillod@dane.gov.co
<https://www.dane.gov.co/>

The Land Administration System Training Experience in Colombia from 2015 to 2021: Achievements, Challenges and Opportunities (11486)
Maria Amalia Florez Huertas (Colombia), Daniel Casalprim (Spain) and Ivan Dario Carrillo Duran (Colombia)

FIG Congress 2022
Volunteering for the future - Geospatial excellence for a better living
Warsaw, Poland, 11–15 September 2022