



STRUCTURE

- Water risk
- Efficient water use
- Synergies
- Governance
- Knowledge and information
- Challenges



"Despite the fact that Colombia is so rich in water, there is a lack of clarity regarding how water is managed and cared for at the national and local levels. In terms of the challenges, I think there are three fundamental things that we need to move forward with: 1. A knowledge system for water information that collects all the country's actual information. 2. Clear guidelines, a policy and specific entities that have sufficient structure and authority to issue guidelines regarding how water should be managed nationally. 3. Work in the regions where decisions are made, collaborating with local communities and institutions to manage and care for water".



- We defined five areas of work to manage water resources in ISAGEN: efficient use, knowledge and information, governance and regulation, synergies and water risk.
- 740 people attended the Meetings for Water, a forum we launched in partnership with El Espectador, WWF and People & Earth to generate proposals that strengthen the resource's governance, management and care nationally.
- Within the context of the initiative known as Dialogue for Water Stewardship, we formalized 13 agreements with 67 community organizations, local authorities and other stakeholders from the Nare River Basin (eastern Antioquia) for responsible water use.
- 50 employees participated in the Water Days, an initiative to share several studies that we're currently carrying out in relation to climate variability and water resources, as well as discuss current issues in the energy sector.
- We developed a pioneering protocol to evacuate sediment at the Calderas power plant, which will increase the useful life of the reservoir and improve energy generation.



It is essential to understand the relationship between water, energy and food, so that we can contribute towards development that's in harmony with the environment. In fact, 13 of the 17 Sustainable Development Goals (SDG) relate to the connection between these aspects. Another important consideration is the dependence of economic activities on water supply that is finite, vulnerable and threatened as a result of pressure from its use, pollution, lack of supply, variability and climate change. To solve this problem, the following is required in Colombia:

- Establishing a systemic vision on water, entailing its governance, as well as the management of energy resources.
- Implementing water-related projects that provide solutions in the context of a multisector approach.

- Moving forward with the implementation of a water knowledge and information system in the country.
- Strengthening the implementation of the Comprehensive Water Resources Policy.
- Achieving concerted local water management in the regions.
- Strengthening the National Water Council so that it has all the technical and scientific knowledge needed to set priorities, manage resources, govern and make decisions regarding environmental, social and economic aspects.

At the global level, we reaffirmed our commitment to the United Nations' CEO Water Mandate, which we joined in 2014. This initiative aims to mitigate the emerging global crisis regarding this vital resource and to guide organizations towards developing a comprehensive strategy for water management and care, based on strategy and operations.

Internally, we strive for organizational consolidation to ensure the comprehensive management of water, and to this end we have established five areas: efficient use, knowledge and information, governance and regulations, synergies and water risk.

In this chapter, we will share the main results and challenges of 2016:

WATER RISK

90.34% of our energy production came from hydropower, which we promote as a sustainable, efficient and clean source that contributes to social and economic development in the territories. Given that water is a strategic resource for the business and a key factor for development in the regions, we identified the level of water-related and climate variability risk at the corporate level (i.e. the climatic and hydrological variability that negatively impacts energy production by the Company's hydroelectric power plants). During the course of the year this risk came to the fore, since it was an atypical period in hydro-climatic terms. The effects of El Niño -which lasted longer than ever recorded in the country- did not relent during the first quarter, reducing hydrological inputs to the reservoirs and affecting the generation of energy. Through strategies focused on maintaining the operation of our power plants and by optimizing commercial management, we were able to meet our commitments to the market.

Main actions to mitigate this risk:

- Research on the effects of climate change.
- Operation and maintenance of the monitoring network for climatological and hydrological variables.
- Development and implementation of flow estimation models under scenarios of variability and climate change.
- Monitoring of energy analyses and announcements from national and international climate agencies.
- **o** Development of a portfolio of generation projects that use renewable sources, including hydro complementarity with the power plants that are in operation.
- O Protection and care of the basins associated with our generation plants.
- O Promotion of national policies for the organized management of water resources.



EFFICIENT WATER USE

Water consumption

Our operations only use water from sources granted under concession, and we strive for their conservation, as well as the protection of the habitats associated with them. We implement programs for efficient water use, while also monitoring water quality, conducting consumption monitoring and control, and carrying out maintenance on networks and treatment systems, among other activities.

Water granted under concession for domestic and industrial use

We withdraw water from surface sources in our six hydroelectric power plants and two diversion structures. For its part, the thermoelectric power plant obtains this resource from underground sources. The flows were granted through administrative acts issued by the competent environmental authorities.



The environmental authorities allocated a specific flow to be withdrawn in the Miel I, Amoyá, Calderas and Sogamoso hydroelectric power plants. Moreover, the flow granted under concession for the San Carlos and Jaguas power plants is not specified in the administrative act, because the government of Antioquia granted all water from the Nare River for energy generation in these hydroelectric plants, and therefore the flow granted Is equal to the turbine flow during the year. It is important to clarify that because the water concession for the Termocentro power plant includes domestic and industrial use, the total value reported includes 339 L/S relating to industrial use in this power plant.

Total and per capita water consumption

Water is supplied to employees, contractors and visitors through distribution networks once it is treated for human consumption. Consumption data is set out in the following table:



Per capita water consumption in the power plants (2015 - 2016)

(liters/person/day)

Power plants	2015	2016	Meta
Amoyá	142.08	132.33	190
Calderas	127.17	118.61	176
Jaguas	186.44	161.06	186
Miel I	166.66	161.29	245
Guarinó	59.44	48.04	-
Manso	40.71	58.10	-
San Carlos	163.89	156.60	196
Sogamoso	266	317.45	-
Termocentro	263.68	264.10	250

Compared to 2015, we recorded a 0.1% increase in the provision of water for domestic use in our generation plants. Five of the six plants that had an established consumption target achieved per capita domestic water consumption that was lower than the target defined for each power plant, thanks to the successful implementation of plans to save water and ensure its efficient use. Regarding the Termocentro power plant, the increase in water consumption was due to the fact that we conducted major maintenance on the entire power plant for three months, and as a result the daily population there comprised more than 300 people, with peaks of up to 320, when traditionally the population totals 100 people. Similarly, damage arose in the water distribution system, and this was repaired. It is worth clarifying that the Manso and Guarinó diversion structures do not have a per capita consumption target since their consumption falls well below what's expressed in environmental regulations, which in this case provide for the provision of 150 l/person/day. Regarding the Sogamoso power plant, the target will be defined in accordance with the creation of the Plan for Water Savings and Efficient Use, which will be structured in 2017, once the adaptation works for the water supply system are completed. The suggested per capita consumption target for 2017 is 317 l/person/day.

Water consumption at our headquarters (2014 - 2016)

	2014	2015	2016
Domestic water consumption (m ³)	12,746	11,587	10,830
Utilization of rainwater in domestic water consumption	698	1,881	2,608

Water consumption savings at our headquarters (2014 - 2016)

	2014	2015	2016
Total annual consumption (m ³)	12,746	11,587	10,830
Total annual budget saving (m ³)	698	1,880.84	2,608.11
Annual budget saving (\$)	3,000,471	8,230,951	12,792,398
Percentage annual budget saving (%)	5.53	16.07	24.35

We improved our training and environmental education campaigns on reasonable water consumption, aimed at employees and contractors. In 2016 we reduced water consumption by 6.53% compared to 2015 and achieved savings of \$12,792,398, thanks to the rainwater collected, with this figure relating to 24.35% of the total paid for consumption in 2016. We achieved consumption reductions due to climatic conditions that were favorable for the collection of rainwater, thus enabling significant utilization of this resource. On average, 250 m³ were collected and utilized each month from March to December.

Per capita water consumption at our headquarters (2014 - 2016)

(liters/person/day)

	2014	2015	2016
Total average monthly consumption* (m ³)	1,162	1,122	1,120
Average monthly occupancy rate for the building	1,528	1,652	1,390
Average monthly consumption per capita (m ³)	0.77	0.68	0.80
Average monthly consumption per capita (liters)	760.40	679.49	805.54
Consumption per capita (liters/person/day)**	29.2	26.1	30.9

* The consumption is the sum of rainwater utilized and water from the municipal water supply system that belongs to Empresas Públicas de Medellín.

** Calculated for 26 days per month.

Per capita consumption increased by 18.6%. The exact cause of the increase is not known, since consumption varies a great deal, and we do not have a way to measure other points inside the building. The margin of error for the calculation is estimated at 15%, since the average monthly staff occupancy rate for the building is variable. Water consumption among people who do not stay for the entire working day, as well as activities such as the use of saunas, washing the building's walls, cleaning, losses from leaks, watering the gardens etc., do not aid the calculation in terms of its accuracy.

Ā	2,613,458 2016	
Volume of total wastewater discharges by all power plants	5,440,715 ²⁰¹⁵	
Total discharges (m³)	313,695 2014	

In 2016, the volume of discharges decreased by 51% compared to 2015. This is consistent with the decrease in industrial water consumption at the Termocentro power plant, which was 67% lower in 2016 than in the previous year. The stabilization pond at the Termocentro power plant, which is the treatment system for industrial water, accounts for approximately 97% of ISAGEN's wastewater discharge volume. The quality of the water discharged from the power plants complies with Colombian regulations, since there are wastewater treatment systems in place that enable the discharges to be purified to levels suitable for release to the soil and to surface water sources. In addition, these discharges are made into water bodies that are not classified as RAMSAR wetlands (i.e. of international significance), recognizing their fundamental and ecological functions, as well as their economic, cultural, scientific and recreational value.

During the year, water quality monitoring demonstrated that the discharges did not affect the quality of this resource and did not generate significant impacts either. Additionally, regarding systems that discharge into surface water sources, we apply the new discharge standard in which discharges are evaluated by concentration (milligrams per liter), taking into account several parameters. A total of 31 of the 38 treatment systems analyzed complied with the standard regarding the concentration of Biochemical Oxygen Demand (BOD) in the effluent. Maintenance was performed on systems reflecting any deviation regarding this parameter, and corrective measures were established to improve them. There were no significant spills in the power plants or facilities, nor were we subject to fines or economic sanctions for breaches of environmental legislation.



SYNERGIES

Water Stewardship

We have taken part in the implementation of this global initiative in partnership with WWF Colombia since 2014. Through this, we want to contribute to understanding our water footprint and strengthen dialogue, so that stakeholders associated with the basin can reach voluntary agreements focused on the protection of water resources, transitioning from philosophical commitments to concrete actions by coordinating the public, private, educational, community and association sectors, among others. In 2016 we held the Dialogue for Water Stewardship in eastern Antioquia, specifically in the Nare River Basin, together with the WWF, CORNARE and EPM. As part of this initiative, we agreed on shared actions and formalized 13 agreements with 67 organizations, local authorities and other stakeholders present in the region, with a view to improving management, reducing impacts and sharing the benefits offered by the Negro and Nare River Basins. The agreements were based on four key themes: conservation of protected areas, drinking water and basic sanitation, citizen participation and advocacy, and rural development.

Moreover, we calculated the water footprint for the areas comprised by the Company's reservoirs. The analyses carried out in the hydroelectric area and the basin have the main added value of supplying new information to generate concrete conservation strategies at the territorial level. However, doubts are raised regarding their interpretation and the usefulness of the result, as it does not offer options to mitigate or reduce the footprint, since in order to improve the water footprint in relation to evaporated water, the main hydroelectric generation activity would become unfeasible due to the decrease in volumes stored.



Dialogue for Water Stewardship in eastern Antioqui

Agreements for basins and water

We continued working alongside CORPOCALDAS to protect the biological diversity and sustainability of the natural resources located in La Miel River Basin. In 2016 we achieved the following: the construction of 111 energy efficient alternatives using efficient stoves and wood-producing gardens, support for basic sanitation initiatives through a total of 93 septic systems, the restoration of 10 hectares, 41,624 linear meters of isolation for wetlands in feeder micro-basins, and 70 solutions for erosion-related problems using plant materials in engineering works, among others.

Comprehensive Action Plans

The Comprehensive Action Plans begin as platforms for dialogue and agreement aimed at transforming socio-environmental conflicts in the basins of the Guarinó and La Miel Rivers. Its stakeholders analyze problems, make agreements, manage issues and implement actions for the protection, recovery and development of basins. In 2016, the main achievements relate to the community strengthening component and its Environmental Leadership School, which produced 30 leaders from the relevant districts, so that they'll be able to tackle environmental issues in their communities and, in turn, begin processes relating to water and territory governance in the basin. Another important achievement relates to having improved quality of life for at least 390 people and their families located in the affected districts and communities, specifically in the Guarinó River Basin. This was thanks to the active participation of communities and the support of the entities that funded the process, which included ecological restoration, bioengineering works and basic sanitation.

With our suppliers

We continued to conduct sustainability audits and taught a course on environmental planning that addressed aspects relating to the rational and efficient use of water resources. In assessing minimum levels of sustainability, we found that 16.56% of companies state that they are dependent on water to produce goods and services. 90.74% of these implement measures to identify the risks posed by the use of this resource. Finally, at the Suppliers' Convention, we held awareness raising conferences on water resource management, enjoying the attendance of 150 of our main suppliers.

With our employees

50 employees participated in the Water Days, an initiative in which we enjoy the participation of experts from academia and the electricity sector to share several studies that we're currently carrying out in relation to climate variability and water resources, as well as discuss current issues in the energy sector, such as hydroelectric plants' environmental impacts and the environmental flow. In addition, at the Corporate Meeting (to which all Company employees are invited) we shared the progress made by the Organization in pursuit of the comprehensive management of water resources.

GOVERNANCE

Promoting public policy

We continued taking part in various national and regional forums for water gobernance promotion, including the ACOLGEN Environmental Committee and the ANDESCO Environmental Chamber. Specifically, we promoted the creation of the National Water Agency to aid governance of this resource at the national level.

Meetings for Water

We have been holding the Meetings for Water in partnership with El Espectador, WWF and People & Earth since 2012. This initiative brings together the government, academia, business and civil society organizations to seek solutions and reach voluntary public and private agreements regarding the governance of water resources. In 2016, the meetings focused on analyzing

how the tax reform might affect water management and financial instruments for the governance of this resource, in order to find alternatives that contribute to Colombia's sustainable development, as well as come up with recommendations and proposals to strengthen governance and improve water management, conservation and care. 740 people took part in these meetings.

Topocoro Reservoir Landuse Plan

In line with our commitment to ensure that the Sogamoso power plant's arrival is an opportunity for development in the region, we developed the Topocoro Reservoir Land-use Plan in conjunction with the communities, social organizations and local authorities. Until the authorities establish final regulations regarding how the reservoir can be used (other than for power generation), we will be happy to support the interested parties in using the reservoir in accordance with applicable regulations.



Reservoir sustainability

We implemented the following actions in order to maintain the useful life of our reservoirs and manage sediment:

- **o** We continued implementing studies and activities aimed at strengthening knowledge of processes relating to sediment production, transport, dynamics and management in the basins that feed the reservoirs and our hydroelectric plants' withdrawal sites..
- We carried out a study to identify the sources that produce the sediment that travels to the San Carlos power plant's Punchiná Reservoir. This study showed the importance of ongoing measurement of the amount of sediment and establishing the most appropriate measures to manage such sediment, so that the reservoirs are not limited to a finite useful life but instead are operated in a sustainable manner..
- We conducted bathymetry for the Jaguas power plant's San Lorenzo reservoir in order to learn about the bottom surface of this water body. This forms part of the monitoring carried out regarding useful volume and sedimentation processes. We will have final results for the measurements in early 2017.
- Representing a first for the country, we have completed and submitted (for evaluation by the National Environmental Licensing Authority ANLA) a protocol to remove sediment and open the reservoir sluice gate at the Calderas power plant. In Colombia, no other hydroelectric power stations have similar protocols to coordinate the operation alongside the comprehensive management of sediment in reservoirs, while also taking into account environmental and social considerations.



Reservoir, Calderas Hydroelectric Power Plant (26 MW).

KNOWLEDGE AND INFORMATION

This area seeks sufficient, relevant information regarding water resources, so that we can carry out all our operations responsibly. As such, we continued coordinating with the Metropolitan Area of the Aburrá Valley and EPM to operate and maintain the Early Warning System for Medellín and the Aburrá Valley (SIATA), which provides us with real-time information on the climatological variables that enable monitoring and improvement of the forecasts for the basins relating to the San Carlos, Jaguas, Calderas and Miel I power plants, and their two diversion structures.

Find out to Meetings for Water 2016





Provide opportunities for reflection in conjunction with El Espectador and WWF, so that voluntary agreements can be reached on the governance of water resources in Colombia, and promote a collective commitment towards the preservation of these water resources. Compliance

O Define the structure for the management of water resources in ISAGEN.

- Continue implementing activities under the ISAGEN-WWF Agreement, in order to build and share collective agreements for the management of water resources in eastern Antioquia.
- Calculate the water footprint in ISAGEN's reservoir areas as part of implementing a water stewardship strategy.



- O Develop the corporate strategy on climate change and the comprehensive management of water resources (2017-2030), as well as its relevant action plan.
- O Maintain opportunities for reflection in conjunction with El Espectador, People & Earth and WWF, in order to improve water management, conservation, governance and care at the national level.
- Continue the partnership between ISAGEN and the WWF in order to follow up on and share the collective agreements reached in 2016 for the management of water resources in eastern Antioquia, identify financial instruments to manage the resource in this region and coordinate the sector in pursuit of sustainable energy development, and move forward with the analysis of climatic variability and its impact on hydroelectric power plants.
- Continue the feasibility study and evaluation regarding alternatives for sediment management in the Punchiná and Calderas reservoirs, as well as measurements of the amount of sediment entering ISAGEN's reservoirs.