

# Investment & projects



We assigned US\$ 3.34 billion to our investment portfolio in 2015.

**We are the company that invests the most in Chile. Between 2015 and 2019 we will transfer over US\$ 20.0 billion into our investment plan.**

We have a structural project portfolio at Codelco. These projects are currently in different progress stages. Bringing this development to fruition is part of the transformation needed in order to ensure the company's future. We need to compensate for natural deterioration of ore grade at the current deposits, boost productivity and add new production in order to keep Codelco at the forefront of the global copper industry.

In addition to structural project execution, the company has a studies project and divisional projects that must be executed annually in order to keep assets operating in accordance with appropriate standards and to improve long-term competitiveness.

In 2015, pre-investment studies and projects required overall investment amounting to US\$ 3.34 billion, which was similar to last year's investment in nominal terms.

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## Investment in 2015

In US\$ millions	
Development projects	1,731
Equipment replacement and facility refurbishment	176
Sustainability	439
Research and studies	116
Business	97
Mine development and deferred expenses	729
Exploration	55
<b>Total</b>	<b>3,343</b>

Note: Data extracted from actual costs as of December 2015 SAP/R3. Nominal currency, subject to accounting adjustments..

## Chuquicamata division

### Structural Project at the Chuquicamata underground mine

We are transforming the largest and hundred-year-old open pit mine in the world into an underground operation in order to gain access to resources that are under the current pit and that will be exploited using the block caving method. We will thus extend the Chuquicamata Division service life by another 40 years.

In this strategic project, we made progress with development at the mine and other underground works for permanent infrastructure in 2015, such as the mine access tunnel, the tunnel for transporting ore using conveyor belts and air extraction.

### Other projects

We continued with the integral investment plan at the concentrate plants and our goal was to achieve and maintain a treatment level amounting to nearly 170,000 tonnes per day and to improve metallurgical recovery. The plan encompasses all processes ranging from ore reception and flotation to tailings thickening. Process optimization projects are added at the concentrate plant in order to improve secondary grinding at the SAG plant, replace floatation cells at the plant with large-scale cells and install a floatation plant to treat smelting slag.

Activities at the smelter include replacing the Pierce-Smith converters and their gas extraction hoods. We conducted studies to incorporate double absorption and double contact at sulphuric acid plants, in order to guarantee compliance with environmental legislation and to reduce operational vulnerabilities. We also wish to highlight the start of the project in order to improve stockyard handling and conditions and concentrate management handling. At the same time, we started studies that will analyze scenarios and alternatives for the future handling of complex concentrates with high impurity content in order to ensure long-term business for the Chuquicamata Division.

At the electrolyte refinery facilities, we continued projects related to facility refurbishment and continued to improve and modernize equipment.

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We continued to expand the Talabre dam - 8th stage, which considers height extension of the dam from 2,490 masl to 2,496 masl. This project will enable operational continuity for the Chuquicamata, Ministro Hales sulphide lines and future Radomiro Tomic production. At the same time, we are continuing the feasibility study in order to build a thickened tailings deposit system at Talabre.

In the hydrometallurgical ore treatment line, we focused on identifying to extend plant feed due to exhaustion of the South Mine.

### Radomiro Tomic division

#### Radomiro Tomic sulphide exploitation structural project

With this development we aim to extract and process sulphide ore reserves, which are estimated at approximately 2.8 billion tonnes, with average copper grade amounting to 0.51%. This is our first strategic project that features the provision of desalinated seawater for its operations, without denying the use of other available and duly authorized sources.

We worked on environmental lobbying for the project awaiting its environmental qualification resolution this year, after submitting Addendum N° 3 in September that provided replies to observations made by the authority.

In virtue of ILO Convention 169, we favorably concluded the indigenous consultation process with most communities in the area of influence.

We have simultaneously worked to develop detail engineering and obtain sectorial permits, as well as the purchasing of land for new facilities, among other related activities.

#### Other projects

We execute projects designed to sustain production and improve mining operation safety in the mine area. We received new haul trucks in 2015 and purchased mining support equipment in order to improve safety for the extraction and crushing processes. In addition, the project was authorized to transfer power transmission lines that will be affected by natural mine development.

We have continued to improve the spent leached ore extraction system in order to address certain leaching plant vulnerabilities, replacing secondary crushers and replacing another five tertiary crushers. The operation took over facilities related to waste dump expansion for low-grade oxide leaching in late 2015.

We commissioned a new intermediate solution management system for primary leaching in order to sustain production levels. In this same area, we continued to refurbish the removal and transport system for spent leached ore produced by the primary leaching of ore.

We continued facility refurbishment projects in the solvent extraction and electrowinning area, such as structural repairs for the electrowinning vessel and improvements for solution management reservoirs.

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We completed connection of the Colana water supply pipeline to the Division's storage tanks in order to improve water supply for our operations. With regard to long-term Division development, pre-feasibility studies were authorized in order to evaluate alternatives for operating the leaching plant with oxidized, mixed and sulphide ore. A pilot plant will also be built in order to conduct small-, medium- and large-scale tests for materials that will be treated by the traditional line and with new technologies such as bioleaching.

In terms of geological and hydrogeological exploration, we continued drilling campaigns and geo-mining-metallurgical analysis of the deposit and adjacent areas in 2015. In addition, a basic study for hydrogeological classification of the Cere-Río Loa basin located east of the facilities was authorized.

### Ministro Hales division

In 2015 we finalized the purchase of mining equipment and installed maintenance infrastructure. In addition, the leachable resources project was completed.

Projects were executed at the concentrate plant and roasting complex in order to increase recovery and operability of our facilities. We wish to highlight the start of a study for automating the embrasure cleaning system at the roasting plant, in order to improve working conditions for people and increase efficiency.

With regard to processes started in 2015, we wish to highlight drilling shafts for hydrogeological control and monitoring at the mine and implementation of fire detection and extinguishing systems in the electrical rooms and for conveyor belts.

In terms of community commitments, we have continued to support accessibility and integration of the Tucnar Huasi and Huaytiquina villas.

With regard to the future extension of the current open pit mine, execution of the South-SW advanced exploration project is continuing and we plan to add resources to the outdoor phase.

We are also continuing with projects associated to exploring a possible future underground exploitation of the deposit. We are consequently developing outlines and drilling plans, as well as engineering for an exploration tunnel.

**We are executing the company's largest investment program in order to ensure Codelco's future and transform its large ore reserves into resources for Chile.**

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### Gabriela Mistral division

With regard to the investment portfolio, we wish to highlight investment designed to ensure operational continuity. We also started the project investment stage in order to install a waterproof liner for Phase VI of the waste dump, which will enable the company to heap these materials according to the division's business plan.

We conducted geological exploration in order to assess mine development possibilities. The results of this exploration enabled us to determine mineralization potential of the Gabriela Mistral deposit beyond the resources currently identified, which can be treated by means of hydrometallurgy. In addition, hydrogeological exploration of the basin was executed in order to improve water supply for operations.

### Salvador division

#### Inca pit structural project

Due to the exhaustion of ore exploitable by means of underground mining, the Inca Pit project aims to extend the Salvador Division's service life and to provide operational continuity. This structural project is currently in the pre-feasibility stage and we are currently studying open pit exploitation for the remaining resources in the main Indio Muerto deposit, which has been exploited underground since 1959 using the panel caving method.

Pre-feasibility studies have been extended because we need additional information about the geo-mining-metallurgical base and need to complement mine-plant capacity alternatives. We will consequently ensure study quality and accuracy before the final recommendation is made.

### Other projects

A mudslide raged through the region in March 2015, causing serious damage to industrial facilities and to the Division's mine camp, temporarily suspending operations. In order to solve this problem, we conducted emergency activities to repair damaged assets and remediate areas affected by flooding and destruction. The main purpose of these investments was to recover and restore basic industrial and drinking water services, restore road circulation and communications, to make the camp inhabitable once again and finally to restore operations at the Division. We are currently executing works in order to provide a final solution for the remaining operational problems.

The main investment portfolio thrust at Salvador in 2015 was to provide operational continuity for the division. We also continued to improve gas extraction and processing levels at the Potrerillos Smelter. This will provide an integral technical solution from the converter furnace doors to the acid plant, complying with new emission regulations for copper smelters.

In order to reduce vulnerabilities, we started the Pierce-Smith converter chimney project in order to reduce altitude and ensure stability while eliminating associated risk for people and facilities.

In turn, completion of platform construction works so that trucks can approach the Teniente Converter marked the end of the slag floatation plant construction project. This project will increase overall metallurgical recovery for the smelting business.

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## Andina division

### Andina Future Development Structural Project

We suspended the Andina 244 Expansion Project Environmental Impact Study in September 2015 in order to seek a new development alternative to balance the need to make use of the largest ore deposit we own with a business case featuring less investment and shorter construction time, in line with the current environmental and industry scenarios.

### New transfer system at Andina structural project

We made headway with the execution of this project that features construction of a new primary crushing station and new ore transport system designed to replace the existing system, since the latter will be affected by pit development.

### Other projects

We completed projects designed to ensure wall stability at the Ovejería dam, together with the incorporation of a second sand distribution line that encompasses the entire length of the dam with its corresponding pumping system and instrumentation.

At the same time, we started works designed to provide operational continuity for the dam over the altitude of 640 meters. In addition, we made investments to implement the committed preventive and corrective practices in order to control seepage downstream from the Ovejería dam wall, more specifically to keep ground water quality appropriate for use as drinking water.

We also started treatment project work execution for drainage water from Andina, 2nd stage, which include catchment sites and fresh and contact water pumping from the North Waste Dump.

According to the schedule, support equipment for operations and earth movement was commissioned at the open pit mine. In addition, we incorporated a 60-ton haul truck at the underground mine in order to reinforce production schedule compliance.

Investment designed to ensure and optimize water usage at operations in accordance with current legislation was also made during the period. These investments included the second stage of plant water usage rationalization and the project known as Water Normalization-Stage 2, whose purpose is to systemize the water rights situation for industrial use according to the provisions established by the General Water Bureau.

## Ventanas division

The most important investment focused on the execution of projects designed to manage fugitive gases and comply with the new emission regulations for copper smelters; specifically for the extraction of secondary gases and gas bleeding at the Teniente Converter, Pierce-Smith converters and the electric furnace. The company also invested in a project designed to eliminate visible smoke in the raffinate firing area and commissioning a project for a tail gas treatment plant at the acid plant. In addition and along these same lines, we conducted a feasibility study for arsenic abatement in the electric furnace.

In terms of development, we are continuing studies in order to make a technological change at the smelter, increase concentrate treatment capacity for the smelter and its productivity, improve gas extraction and reduce operating costs.

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In addition, we started a project for building a plant for anodic slime pregnant in copper solution in order to prepare, package and send this to the future metal recovery plant being built in Mejillones.

With regard to energy efficiency, we confirmed execution of a project to replace diesel oil burners with oxygas burners in the electric furnace, generating savings and making the process cleaner.

## El Teniente division

### New level for the Teniente mine structural project

CEI Teniente, the largest underground mine in the world, aims to take exploitation deeper with this development, adding reserves amounting to approximately 2.0 billion tonnes with average copper grade of 0.86% and molybdenum grade of 220 ppm. This will enable the Division to continue production for over 50 years.

Work progress has slowed because we need additional studies and analysis in order to better respond to geomechanical conditions detected in the rocky massif and to adjust aspects related to project engineering. In order to address these new conditions, we have fortification system, working method and cutting-edge technology actions and analysis underway in the construction processes.

### Other projects

In 2015 we continued to execute mining projects that will enable us to restore mine productivity, replacing sectors located above the New Mine Level project exploitation that are presently being exhausted.

In late 2015 we completed the feasibility study for the Diablo Regimiento Project-Phase V and started the execution stage. Commissioning is scheduled for late 2016 and the project is expected to send 8,000 tonnes per day of ore to the benefiting plant, while producing 126,000 tonnes of fine copper in 8 years. This phase is the last of 5 planned phases for exploitation of the Diablo Regimiento sector, which will enable production at a rate of 28,000 tonnes of ore per day, with three phases operating simultaneously.

We also started the Dacita project, which features estimated capacity of 17,000 tonnes of ore per day starting in 2020, producing 484,000 tonnes of fine copper over a 12-year period.

In addition, we have made progress with the Pacífico Superior project, which will produce 209,000 tonnes of fine copper throughout eight years of operation. In addition, we conducted feasibility studies for the project designed to exploit resources north of the deposit.

In addition, we continued with the project for height extension of the Carén Dam wall - 6th stage, which will enable operations during the second half of 2018. This development also considers complementary works such as roads, swell catchment and evacuation works, together with other infrastructure works. At the same time, we started the feasibility study for the 7th stage for height extension of this same wall, which will provide operational continuity for El Teniente up until the first half of 2023.

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**We have a portfolio with six structural projects, which are part of the transformation needed in order to ensure the company's future.**

We started feasibility studies for the following projects related to the Caletones smelter:

- The reduction of gas scrubbing plant emissions.
- Slag treatment plant for the Teniente converters.
- A pre-feasibility study for reducing the opacity of smoke produced by anodic furnaces.
- Optimization of fluosolid drying plants..

Once these projects have been given the go ahead, this will enable the Caletones smelter to comply with Chilean legislation for smelter emissions with regard to sulphur dioxide, arsenic, opacity and particulate matter starting in December 2018.