• Introduction to CEMEX
• EU ETS in a sight
• EU ETS for cement sector
• CEMEX low carbon strategy
• CO2 reduction actions by CEMEX
  • Use of Alternative Fuels (AFs)
  • Use of clinker substitutes
  • Energy efficiency
  • Renewable energy sources
  • CDMs
  • R&D
• Monitoring CO2 emissions. CSI Protocol
• Results from CEMEX Low carbon Strategy until 2012
INTRODUCTION TO CEMEX
• **Annual sales** 2012 US$14.9 billion, EBITDA 2012 US$ 2.6 billion

• **One of the leaders in each of our core businesses:** cement, aggregates, and ready-mix concrete

• **Presence in more than 50 countries** across the Americas, Europe, Africa, the Middle East and Asia

• **Trade relationships in more than 100 nations** and one of the world’s top traders of cement and clinker

• **Approximately 44,000 employees** worldwide
We supply **cement**, **ready-mix concrete**, and **aggregates**, as well as a range of other construction products and services.
Today, CEMEX is a global player with solid positions in the cement, aggregates, and ready-mix businesses.
European Union CO2 Emissions
Trading Scheme
ETS
European Union Emissions Trading Scheme (ETS)

- **Launched**: 2005
- **Covers**: Nearly half of all EU CO2 emissions, 40 percent of greenhouse gas emissions.
- **Mandatory**: For all 27 EU members, plus Iceland, Liechtenstein and Norway.
- **Target**: 21 % emissions cut below 2005 levels by 2020.
- **How it works**: Member states allocate a quota of carbon permits to some 11,000 industrial firms and power plants. About half of permits are auctioned from 2013.
  - Carbon leakage sectors (risk of being moved outside Europe), receive a free allocation.
  - Firms can use a limited number of U.N.-backed carbon emission offsets.
Reduction CAP from 2013 – 2020 for total EU and for Industrial sectors

2020 ETS CAP estimated at 1,716 M ton
~19% implicit reduction versus 2005 emissions


-19%
Linear reduction factor

**Total Volume - Bottom-up**

- Historic Production \* Benchmark
- Year: 2013 to 2020
- Arbitrary units: 0.9 to 1.1
- Chart: Bottom-up

**Total Volume - Top-down**

- Constant share of overall ETS
- Year: 2013 to 2020
- Arbitrary units: 0.9 to 1.1
- Chart: Top-down

**Total Volume - Combined**

- Year: 2013 to 2020
- Arbitrary units: 0.9 to 1.1
- Chart: Bottom-up, Top-down, Minimum
ETS for cement sector
Direct CO2 is emitted during the thermal process in the kiln, in which is produced clinker.

At the kiln there are two sources of CO2:
- Process CO2 from chemical reactions, mostly unavoidable. About 60% of total kiln emissions.
- Thermal CO2 from combustion of fuels. Remaining 40%.

Clinker is ground with mineral additions at cement mills for the production of cement. Indirect CO2 from electricity consumption.
BENCHMARK Average 10% bests ~0.766 tCO₂/t grey clinker and 0.987 t CO₂/t white clinker

Gross CO₂ emission per tonne clinker

Global average 866 kg/ton at P60

Average minus 10%: 766kg/ton
CEMEX and ETS
IEA has made a Road Map showing the possibilities of CO2 reduction for the cement industry, from now to 2050, considering existing technologies and new developments like carbon Capture and Storage.

For each technology has been measured the possible percentage of reduction compared with a baseline (evolution of emissions in an scenario without reductions).
CEMEX's efforts to reduce the carbon emissions, in line with IEA Road Map are focused on:

- **First cement company publishing carbon footprint for its products.**
- **Substitution of fossil fuels** by lower CO₂ emission factor fuels.
- **Cementitious materials** reducing clinker content of cement.
- **Increasing energy efficiency and reducing electricity consumption.**
- **Renewable Energy**
  - Wind Farms
  - Waste to Energy
  - Biofuels for transportation
- **Clean Development Mechanism (CDM) Projects.**
- **R&D projects** like CCS (Carbon Capture and Storage)

www.cemex.com
CEMEX is leader use of alternative fuels in the cement industry, with a goal to reach an alternative fuel substitution rate of 35% in 2015.

In Europe, urged on ETS reduction compromises, plants have already reached figures higher than 50%, with some kilns over 75%.

In 2016, 96% of our plants burned AFs.
Waste used as fuel: Tyres, liquids, sewage sludge, animal meals, fluff, wood, agricultural waste
Clinker substitution

- As clinker production is the source of CO2 emissions, if we use clinker substitutes in our cements, reduce the specific emission of CO2/ton cement.
- In 2012, our overall clinker factor (the ratio of clinker content to total cement production) was 76.5% down from 84.3% in 1990.
- Many of those replacing materials are derived from waste streams for other industries.
- Materials include: fly ash from power plants, blast furnace slag from pig iron production and volcanic ash.
A new waste to energy plant is going to provide 80% of our cement plant in Rudersdorf (Germany).

In the Philippines, CEMEX is developing a six-megawatt waste-heat-to-energy facility to produce usable electricity from captured waste heat from our cement plant in Antipolo City in the province of Rizal.
Example of energy saving
Drying of sewage sludge with exhaust kiln gases

The use of exhaust gas from the clinker kiln to dry the sewage sludge, saves all the conventional fuels normally used for this kind of applications (fuel, natural gas), avoiding the CO2 emissions associated to the combustion of those fuels.

TRADICIONAL PROCESS

Urban Waste → Water treatment plant (80% humidity) → Landfilling Fertilizer

DRYING PROCESS

Urban Waste → Water treatment plant (80% humidity) → Sewage Sludge Drying → Landfilling, fertilizer, incineration

INNOVATIVE PROCESS, INCLUDING VALORIZATION AND DRYING USING RESIDUAL HEAT

Urban Waste → Water treatment plant (80% humidity) → Sewage Sludge Drying → Valorization

Cement Plant (Alicante) → Kiln → Heat Recovery → Valorization

Heat: Gas, Cogeneration
- Projects for saving CO2 in non-annex 1 countries, generate CO2 allowances, used to offset emissions at EU ETS.
- So far CEMEX has successfully obtained the UNFCCC approval for 14 CDM Projects and is still working to get this accreditation for some additional potential initiative.

### 2013 CDM Projects Portfolio in CEMEX

<table>
<thead>
<tr>
<th>Project</th>
<th>Category</th>
<th>tCO2e/year</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eurus</td>
<td>Wind Farm</td>
<td>599,571</td>
<td>Registered</td>
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<tr>
<td>Costa Rica</td>
<td></td>
<td>39,972</td>
<td></td>
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<tr>
<td>Ibague</td>
<td></td>
<td>146,798</td>
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<tr>
<td>Zapotiltic</td>
<td></td>
<td>47,043</td>
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<tr>
<td>Egypt</td>
<td></td>
<td>416,528</td>
<td></td>
</tr>
<tr>
<td>Panama Kiln 1</td>
<td>Alternative Fuels and Biomass</td>
<td>29,212</td>
<td>Requesting Registration</td>
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<tr>
<td>Merida</td>
<td></td>
<td>41,513</td>
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<tr>
<td>Tepeaca</td>
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<td>103,359</td>
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<tr>
<td>Tamuín</td>
<td></td>
<td>47,853</td>
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<tr>
<td>Dom Republic</td>
<td></td>
<td>99,797</td>
<td></td>
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<tr>
<td>Huichapan</td>
<td></td>
<td>51,357</td>
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<tr>
<td>Cucuta</td>
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<td>42,307</td>
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<tr>
<td>Atotonilco</td>
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<td>68,579</td>
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<tr>
<td>Valles</td>
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<td>45,926</td>
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**TOTAL REDUCTION POTENTIAL:** **2,444,669**
CEMEX participates in R&D projects in relation with carbon capture and storage (CCS) with other EU cement producers.

Also supplies kiln exhaust gases with CO2 in an external algae project at one plant in Spain.
The Cement Sustainability Initiative (CSI) is a global sustainable effort by 24 major cement producers with operations in more than 100 countries. They account for around 30% of the world’s cement production. Five Chinese companies are current members or applicants.


CSI has developed a methodology for calculating CO2 emissions, with a view to reporting these emissions transparently.

It addresses all direct and the main indirect sources of CO2 emissions related to the cement manufacturing process, in absolute as well as in specific terms.

The protocol comprises three elements:
- Guidance Document
- Excel Spreadsheet
- Internet Manual: www.cement-co2-protocol.org
## Results from CEMEX Low carbon Strategy

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<tbody>
<tr>
<td>Clinker factor (%)</td>
<td>84.3</td>
<td>81.4</td>
<td>75.9</td>
<td>75.1</td>
<td>76.5</td>
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<tr>
<td>Alternative fuels rate (%)</td>
<td>0.8</td>
<td>5.1</td>
<td>20.3</td>
<td>24.7</td>
<td>27.1</td>
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### Direct emissions

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<tbody>
<tr>
<td>CO2 emissions avoided</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>from clinker factor (tons)</td>
<td>1,943,054</td>
<td>4,909,144</td>
<td>5,316,862</td>
<td>4,717,703</td>
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<tr>
<td>CO2 emissions avoided</td>
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<tr>
<td>from alternative fuels factor (tons)</td>
<td>256,468</td>
<td>1,574,212</td>
<td>1,755,724</td>
<td>2,521,083</td>
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<tr>
<td>Total CO2 emissions avoided</td>
<td></td>
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<tr>
<td>Vs. Business-as-usual 1990</td>
<td>2,199,522</td>
<td>6,483,355</td>
<td>7,072,586</td>
<td>7,238,786</td>
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<tr>
<td>Baseline (tons)</td>
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### Indirect emissions

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<tbody>
<tr>
<td>CO2 emissions avoided</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>from Eurus Project (tons)</td>
<td>440,939</td>
<td>489,169</td>
<td>581,953</td>
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</tr>
</tbody>
</table>

The total savings in 2012 are equivalent to offsetting the average annual emissions of 1.5 million passenger vehicles.
MANY THANKS AND I AM READY FOR YOUR QUESTIONS
EXAMPLES
Example 2 – Sewage Sludge facilities
Example 4 RDF system
EURUS a wind farm project is registered as a CDM under the UNFCCC, and has one of the largest emission reduction index per MW in the world (2.4 kton CO$_2$/ MW)

- 250 MW with 167 Acciona AW-1500 wind generators covering 2.000 Has.
- Supplies 25% of CEMEX’s electricity requirements in Mexico
- Enough energy for a city of half a million
- Investment of 550 MM USD
- With a reduction potential of 600,000 CO$_2$ ton/year Eurus is the third largest wind CDM in the world