ENCUENTRO INTERNACIONAL DE DOCTORANDOS EN INGENIERÍA CIVIL (EIDEIC 2018)

EXPERIMENTAL CHARACTERIZATION AND PERFORMANCE EVALUATION OF CONVENTIONAL AND ENHANCED GEOTHERMAL GROUTING MATERIALS UNDER OPERATIONAL CONDITIONS

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Wednesday 16 May 2018 | Santander

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PERSONAL MOTIVATION

BACKGROUND ALWAYS LINKED TO RESEARCH:

- 2007: R&D Technician (Industry)
- 2009: R&D Project Management (Industry)
- 2011: R&D Project Management (University)
  - ➢ PhD initiated in 2012 (temporary break)
  - ➢ New admission in 2017 : New research linked to previous project.

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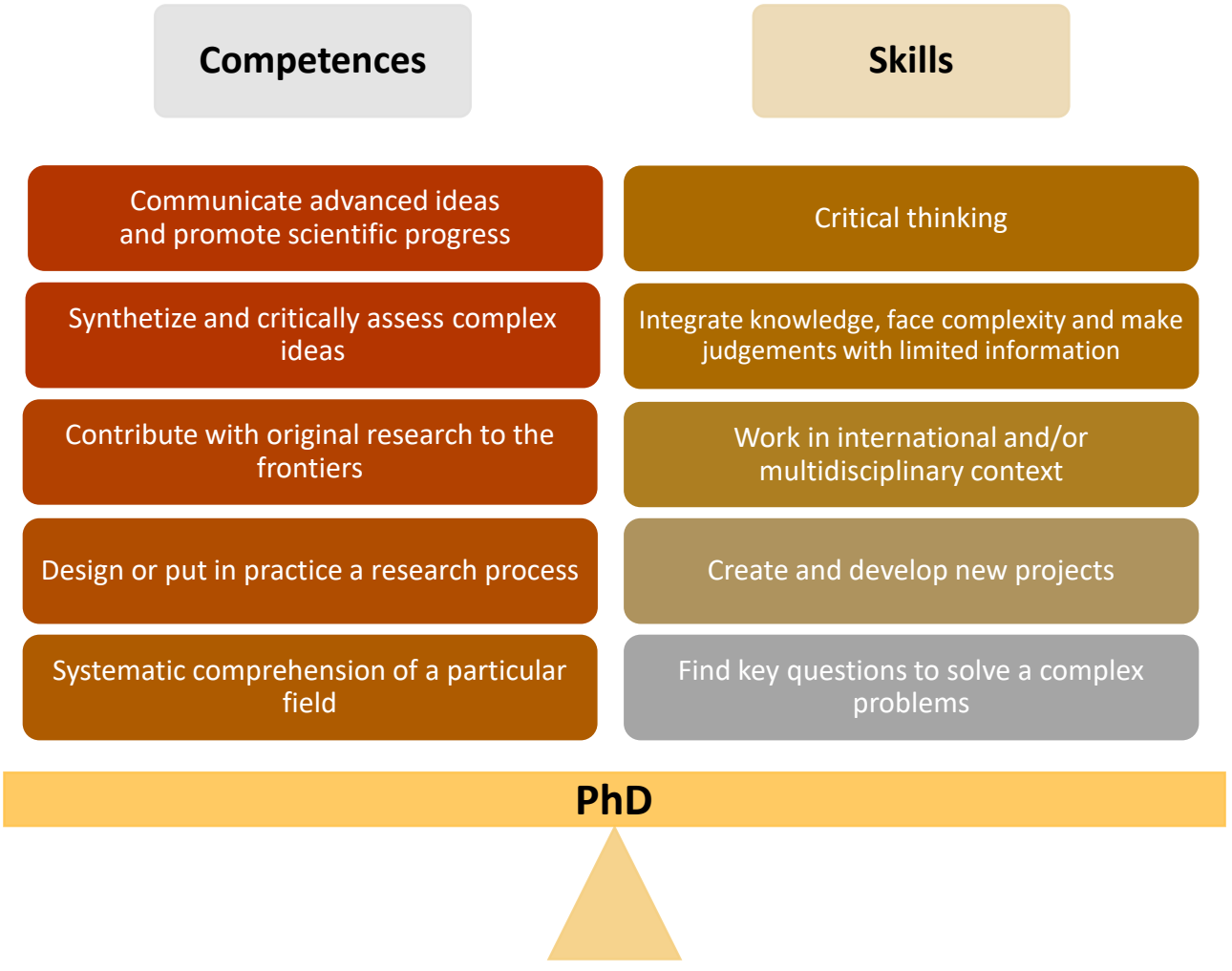
PERSONAL MOTIVATION

WHY A PhD?



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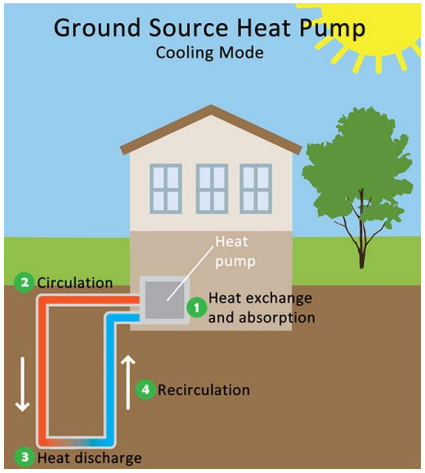
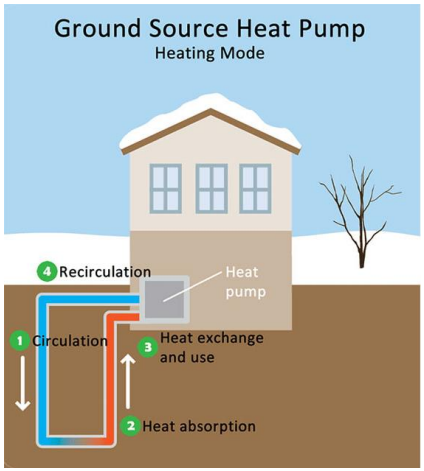
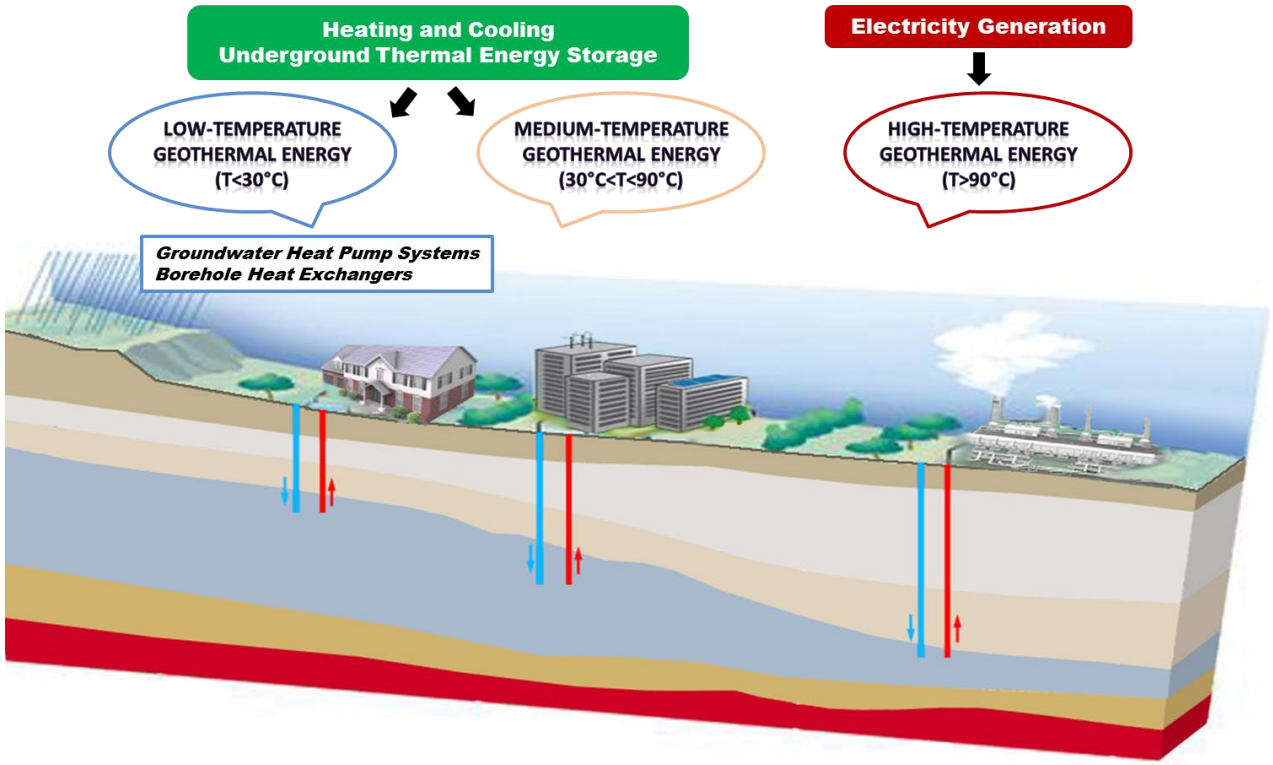
CONTEXT OF THE RESEARCH: ground source heat pumps

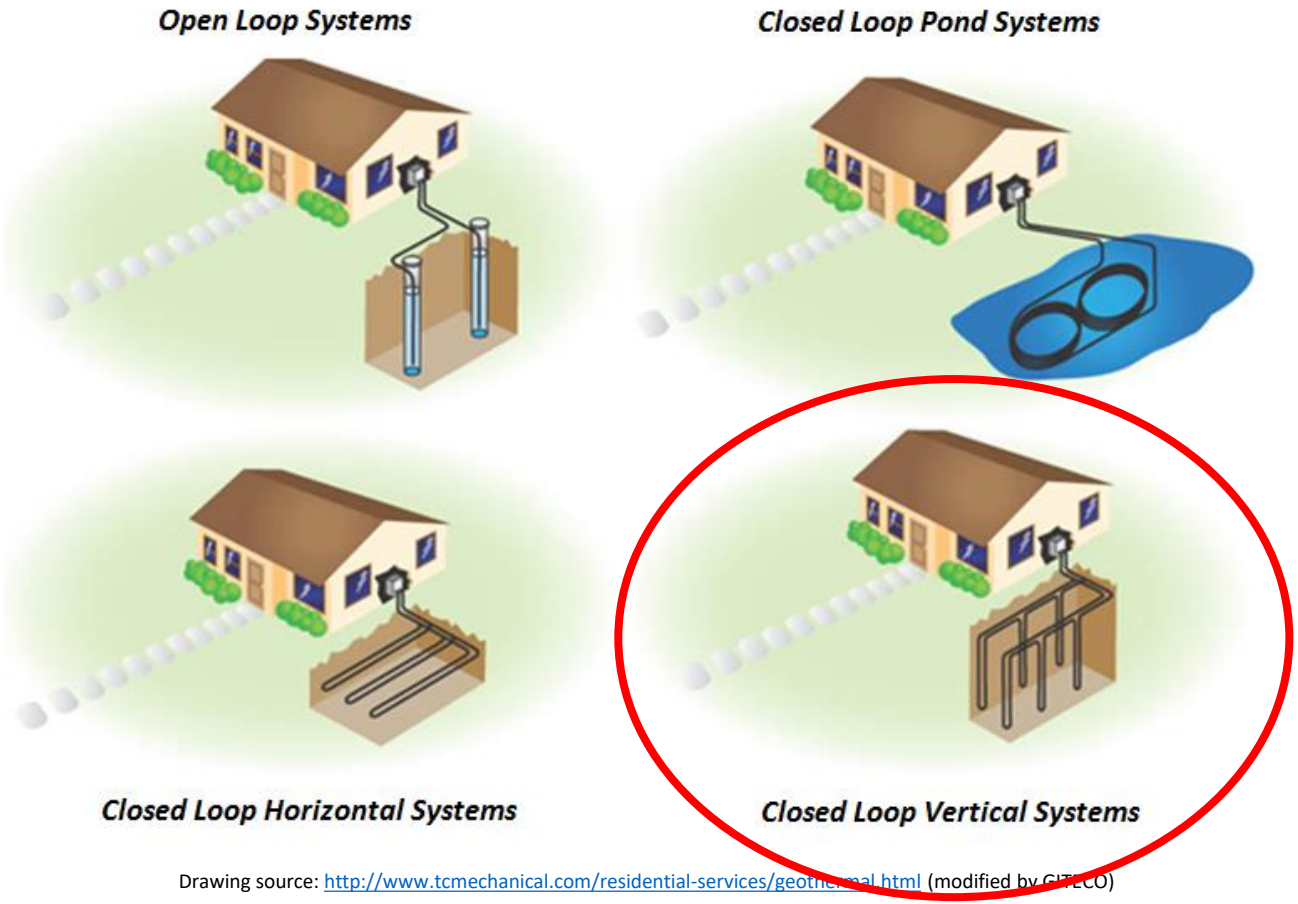






Source: www.eosys.fr/act_renew_energ.html

CONTEXT OF THE RESEARCH: ground source heat pumps



Drawing source: http://www.tcmechanical.com/residential-services/geothermal.html (modified by GITECO)

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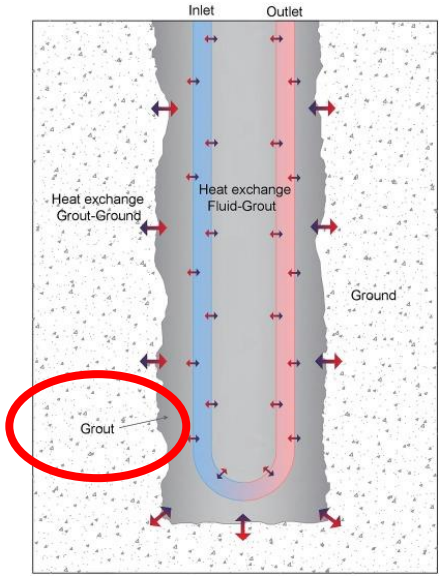
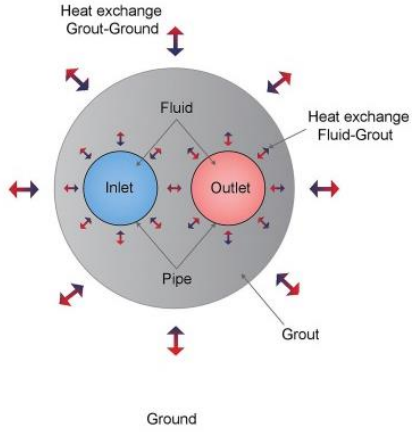
CONTEXT OF THE RESEARCH: grout material





- Functions:
  - ✓ Allows borehole stability.
  - ✓ Act as hydraulic barrier.
  - ✓ Provide efficient heat transfer.
- Required properties:
  - ✓ Very low permeability.
  - ✓ High thermal conductivity.
  - ✓ Good mechanical properties.
  - ✓ Pumpability.
- Type of grouts:
  - ✓ Cement-based.
  - ✓ Bentonite-based.
  - ✓ Cement-sand-based.
  - ✓ Enhanced grouts.

C.S. Blazquez et al. / Renewable Energy 114 (2017) 1189-1200

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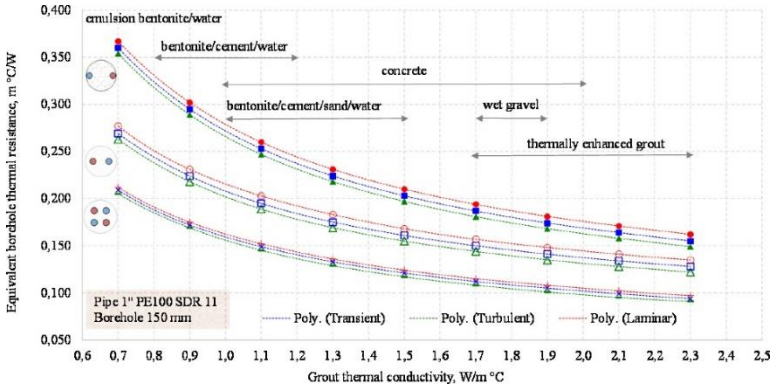
CONTEXT OF THE RESEARCH: problems targeted

- Lower thermal perfomance of the conventional grouting materials.



Grout thermal conductivity vs equivalent borehole thermal resistance for different borehole designs
(Sustainable Cities and Society 31 (2017) 1–11)

- Conventional grouting materials unable to withstand certain extreme situations.

Fleuchaus and Blum *Geotherm Energy (2017) 5:10*

CONTEXT OF THE RESEARCH: objectives

- Performance evaluation of geothermal grouting materials subjected to heating-cooling, wet-dry and freeze-thaw cycles. *[Thermal, mechanical & hydraulic evaluation]*
- Design and characterization of geothermal mortars that combine good enough workability with suitable thermal and mechanical performance.
- Performance evaluation of enhanced mortars subjected to wet-dry cycles. *[Thermal, mechanical & hydraulic evaluation]*

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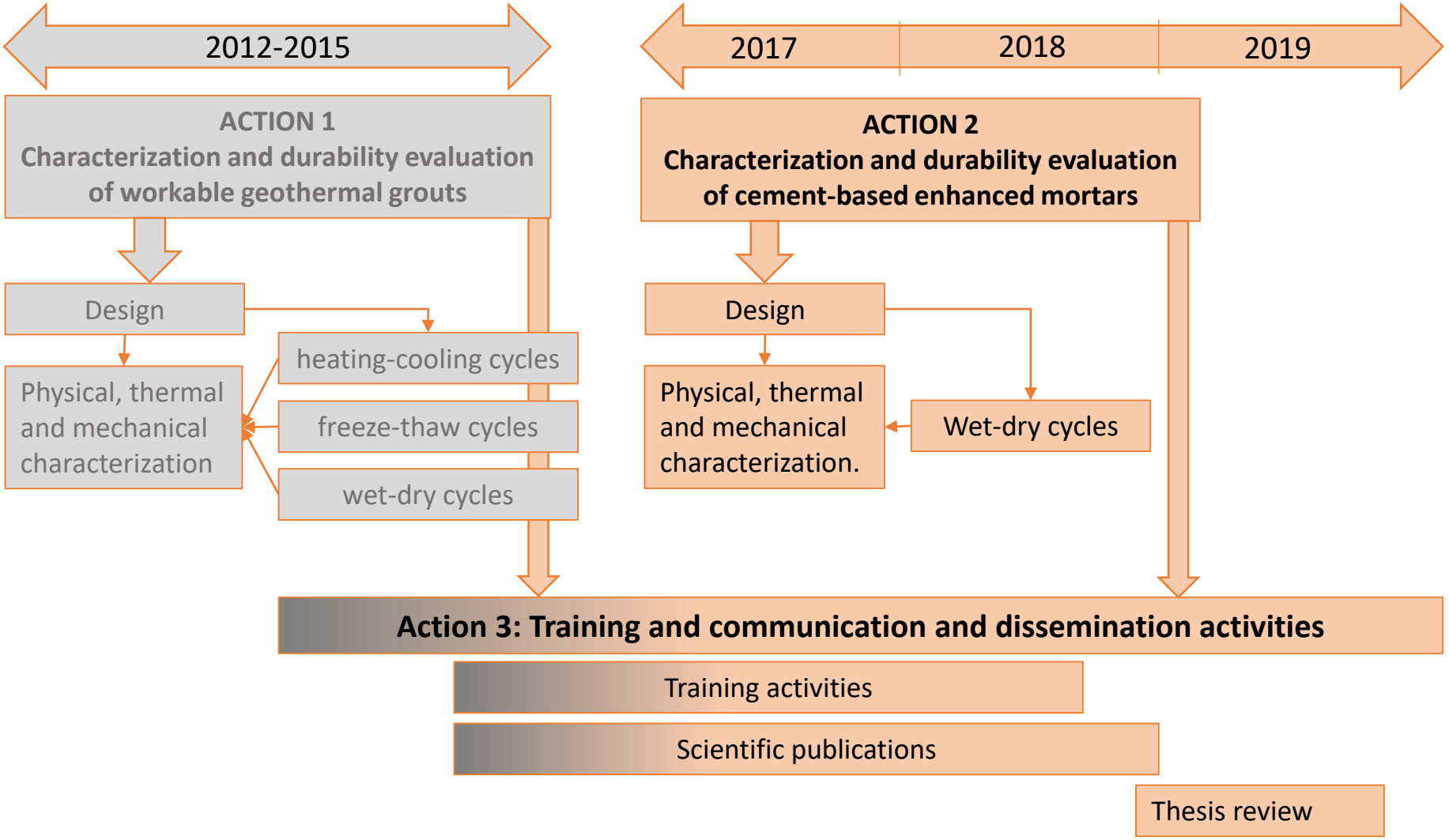
RESEARCH PLAN



Thank you for your attention!
Any question?

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