

# LIPS2015 Barcelona

## Lean in Public Sector Construction Conference

### Session 5 : Informes Regionales

### Informe de Sudamérica

#### Patricia Tillmann

Lean Integration Specialist

Postdoctoral Scholar at UC Berkeley

MSc. PhD. Federal University of Rio Grande do Sul

#### Luis F. Alarcón

Director Production Management Center (GEPUC)

Pontificia Universidad Católica de Chile



#LIPS2015  
@itec\_es

# Lean Construction in Brazil

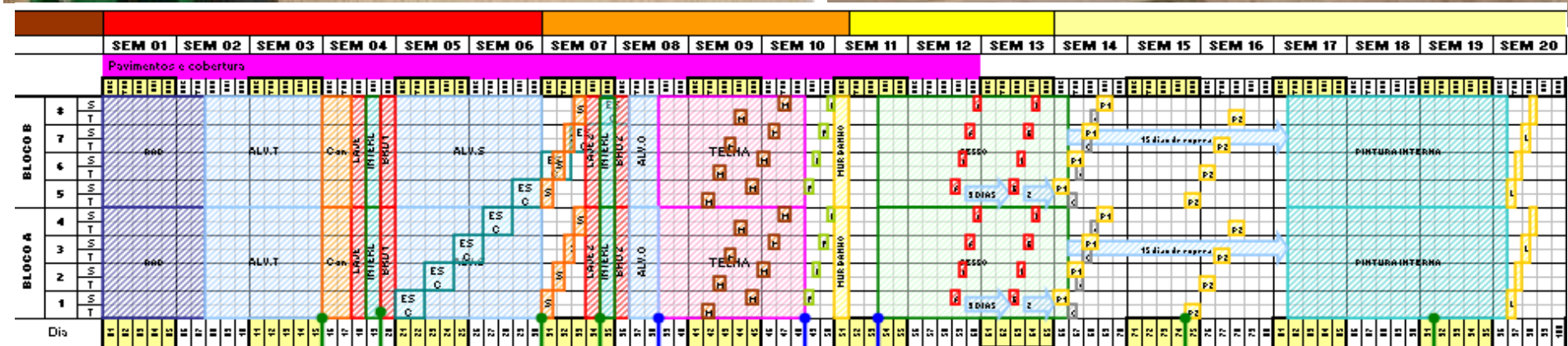
## Public Sector – industry and academia



- Introduced around ~1996
- First IGILC held in Brazil was 2002
- LCI Brazil was founded in 1998
- Lean in the public sector:
  - Many lessons learned. Over 15 years of research with the Government;
  - Large improvements on companies participating on public projects (including Communities of Practice);
  - Many challenges to overcome by public agencies trying to adopt lean;
  - **Positive changes with World Cup and Olympics.**

# Lean Construction in Brazil

## Lean principles in housing programs



# Lean Construction in Brazil

## Public Sector – Lean principles and methods used



### Diagnostics:

- Value stream mapping (office and field)
- Value generation, Program impact evaluations

*\*NORIE - Federal University of Rio Grande do Sul* has ~15 years of research to improve governmental operations with lean principles

### Implementations:

- Production planning and control (e.g. Last planner system)
- Improvements in Logistics

*\*Steinbock Consulting* implemented lean in 48 out of 50 projects for the government.



# Lean Construction in Brazil

## Public Sector – Diagnosis



Housing project



Community development project



Road infrastructure project



Income generation project

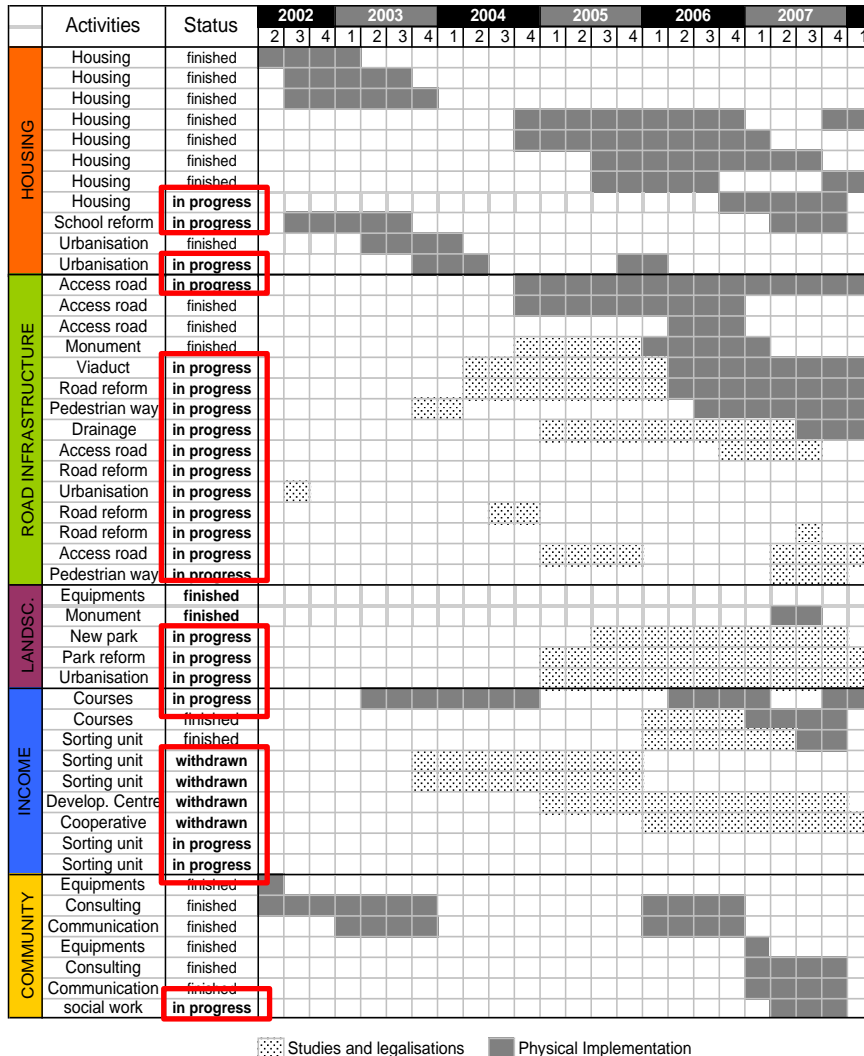


Landscaping project



# Lean Construction in Brazil

## Public Sector – Diagnosis



**Deviation Infrastructure projects (TRU):**  
**Last 5 years**  
**Over budget: +13% to +123%**  
**Late: + 13% to +279%**  
**Auditing: 73% irregular (213 projects)**

# Lean Construction in Brazil

## Laws as obstacles for lean and initiatives to change



- **Lowest bid (Law 8.666, 1993)**
  - Emerged as a response of scandals and favoritism in the construction sector.
  - Public sector is responsible for risks
- **Concessions (Law 8.987, 1995)**
  - Private parties are responsible for risks
- **PPP – Public Private Partnerships (Law 11.079, 2004)**
  - Projects over R\$20M
  - Risks are shared between Public and Private sector
- **RDC – Differentiated Regime for Contracting (Law 12.462, 2011 – specific for World Cup and Olympics) **NEW!****
  - All phases under the private sector – contractor
  - Selection based on costs and technical requirements
  - Was extended for the Growth Acceleration Program (PAC) and Public Hospitals (SUS)

# Lean Construction in Brazil

## Public sector contracts that require lean?



Not yet. But there are other motivations to adopt lean:

- Increased demand for accountability – costs and time (its making companies adopt lean)
- Increased intervention of the State on monitoring construction projects (World cup and Olympics)
- Economic stability





# Lean Construction in Brazil



## Lean principles in public infrastructure projects

### Garantia de Prazos e Aumento de Produtividade

Arena da Copa 2014 | 14 meses de Consultoria



#### Resultados

- (-) 23% dos prazos das frentes iniciais
- (+) 35% de produtividade das frentes iniciais
- (-) 27% dos recursos planejados (Mão de obra, materiais e equipamentos)

#### Conceitos Chave

- Reorganização orientada a processos e visão macro
- Implementação do Planejamento e Controle do Takt
- Manufatura enxuta e sincronizada
- Gestão de Parceiros
- Logística Integrada: Interna e Externa

### Redução de Custos Operacionais Aumento de Produtividade

Bus Rapid Transport | 9 meses de Consultoria



#### Resultados

- (-) 33% de prazo de execução em trechos densos
- (+) 300% de produtividade nas frentes críticas
- Gestão de avanço como modelo para o cliente público

#### Conceitos Chave

- Diagnóstico operacional
- Balanceamento e sequenciamento das frentes
- Sincronização da logística de abastecimento
- Implementação de Ciclos de Gestão da Produção em Campo

# Lean Construction in Brazil

## Conclusions



- Advances on understanding Lean principles in the public sector (15 years)
- Establishment of communities of practice (companies working for the government)
- Positive changes in public sector construction projects over the last 5 years – new forms of contracting, new laws, increased pressure for better performance from governmental agencies and the media
- Leading to increased adoption of lean techniques and improvement of processes
- However, demand for lean is still not coming from the government and monitoring agencies.



Obras realizadas por grandes construtoras com a filosofia da Excelência Operacional.



BRT Transcarioca



BRT Transcarioca



Novo Elevado João



Fábrica de Escolas



Reservatórios Profundos



BRT TransBrasil

O que já vem acontecendo...



### Construtoras

Maior produtividade

Controle firme de custos e qualidade

Mais credibilidade e imagem

Potencialização de resultados



### Governo

Bom cumprimento de prazos

Aumento de capital político

Menos pleitos

Fiscalização mais transparente



### Comunidade

Mais bens em uso

Melhora no trânsito

Mais orgulho da cidade



# Lean Construction in Colombia

(basado en artículo IGLC 2015)\*



## PERCEPTION AND DISPOSITION TO IPD

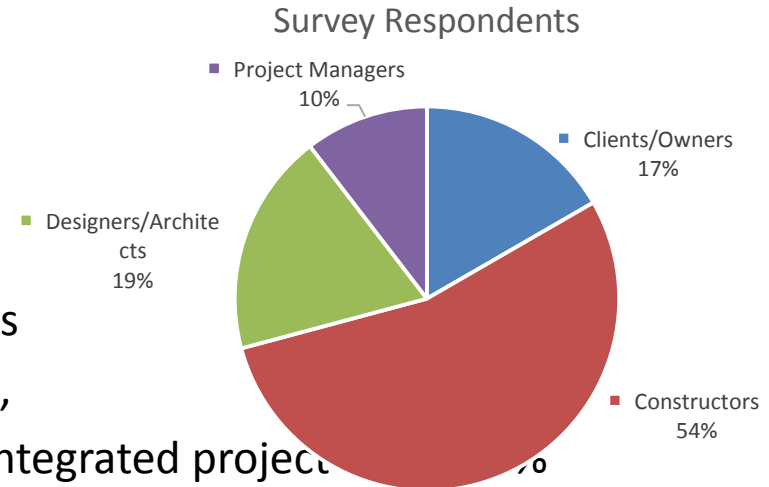
- Survey to nearly 50 owners, contractors and designers

## KNOWLEDGE AND PERCEPTION

- Less than **40%** of **Clients/Owners** and Architects have knowledge of IPD concept tools and concepts, However, when exposed to the concept of an IPD integrated project answered that they would join a team like that

## TOOLS AND CONCEPTS IMPLEMENTED

- Some tools and concepts implemented in IPD have gained more acceptance and recognition than the doctrine itself. This is the case of **Building Information Modeling** and **Lean Construction – Last Planner**
- This suggests that in Colombia IPD tools such as BIM and Lean are more popular than IPD itself and multiparty contacts.



\* Forero, S. , Cardenas, S. , Vargas, H. & Garcia, C. 2015, 'A Deeper Look Into the Perception and Disposition to Integrated Project Delivery (IPD) in Colombia' In:; Seppänen, O., González, V.A. & Arroyo, P., *23rd Annual Conference of the International Group for Lean Construction*. Perth, Australia, 29-31 Jul 2015. pp 297-306

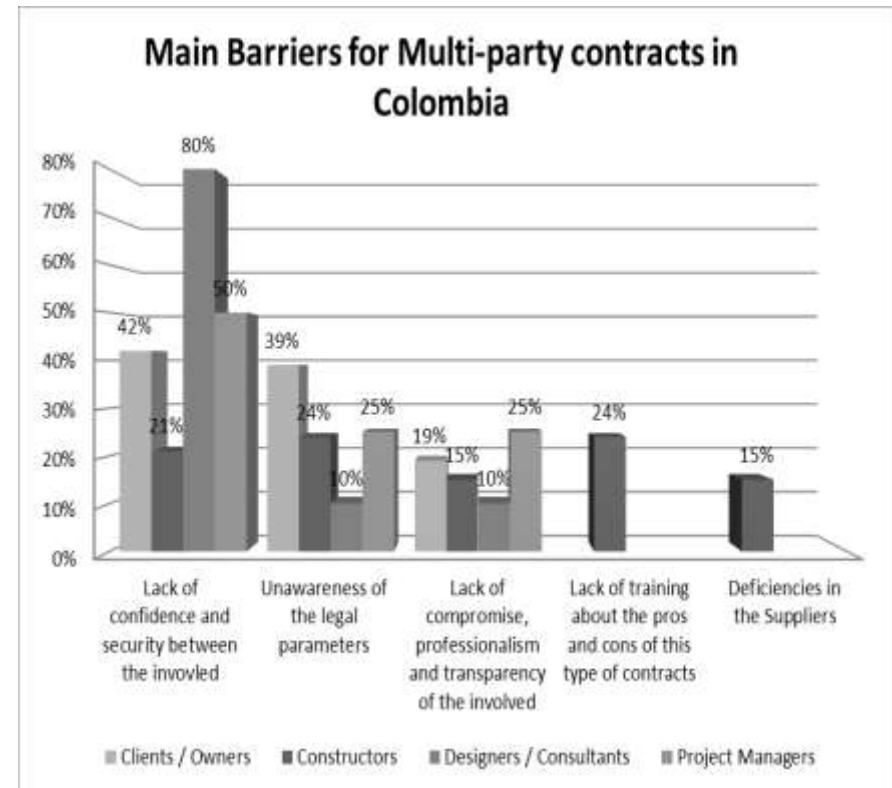
# Lean Construction in Colombia

(basado en artículo IGLC 2015)\*



## FINDINGS

- The construction industry in Colombia tends to be very **traditional**, but that does not mean that they are not ready **to adapt and change**.
- IPD can be implemented in Colombia. All parties have **60%** (or greater) **willingness of signing a multi-party agreement**.
- It is necessary to address the biggest perceived **obstacle** which is the **lack of confidence and trust**.





# Lean Construction in Peru

(Thanks to P. Orihuela and JL. Izquierdo)



## TRADITIONAL PRIVATE CONSTRUCTION

- There have been attempts to understand and apply the IPD contract but not in its complete form at the momento. However, there is little incentive to explore it now, due to the intensive competition among contractors. Designers are not interested in this scheme.
- Certain clients are proposeind adapted versions of IPD, which are converted to lump sum after a a bidding process adn contain other elements that increase the risks for contractors, decrease the interest of designers and reduce the interest in collaboration.

## MORE ADVANCED SECTOR

- Services in the mining sector, which sometimes include construction services is probably the área with more progress. Alliance Contracts have been applied in this sector, originally promoted by Australian clients, which have been previously exposed to collaborative contracts. This contracts are related to earth movement, drilling and blasting, transportattion of materials and other services related to mining operations.

# Lean Construction in Peru



## SECTOR PUBLICO

- Public-Private initiatives have been promoted in the last 3 years. Public managers have been exposed to IPD in workshops and seminars, but progress is very slow.
- There is an innovation in the Government contracting laws, that is currently under study. The new law includes seven different selection procedures, one of them is called Special Contracting Methods, which could open doors to IPD contracts. However, it seems that will be applicable only to small contracts.

# Lean Construction in Chile

## Private sector



### TRADITIONAL PRIVATE CONSTRUCTION

- There is knowledge and increased implementation of Lean Construction in Construction companies, but less progress in owners and designers.
- BIM adoptions is increasing and getting momentum
- No IPD type contracts have been applied so far.

### IMPORTANT PROGRESS

- Big owner companies in energy and mining sectors have started to contractually require their contractors the use of lean methods such as Last Planner or 5 S.
- In hospital projects, where GEPUC has participated as consultant, IPD type collaborative work has been facilitated, but without using IPD contracts. Designers have shown reluctance to use IPD.
- Service contracts that align participants objectives have been used in the mining sector, originally promoted by private mining companies.
- Also in the mining service sector, mining companies have developed efforts to develop their suppliers, promoting training and permanent collaboration in programs specially designed with this purpose.

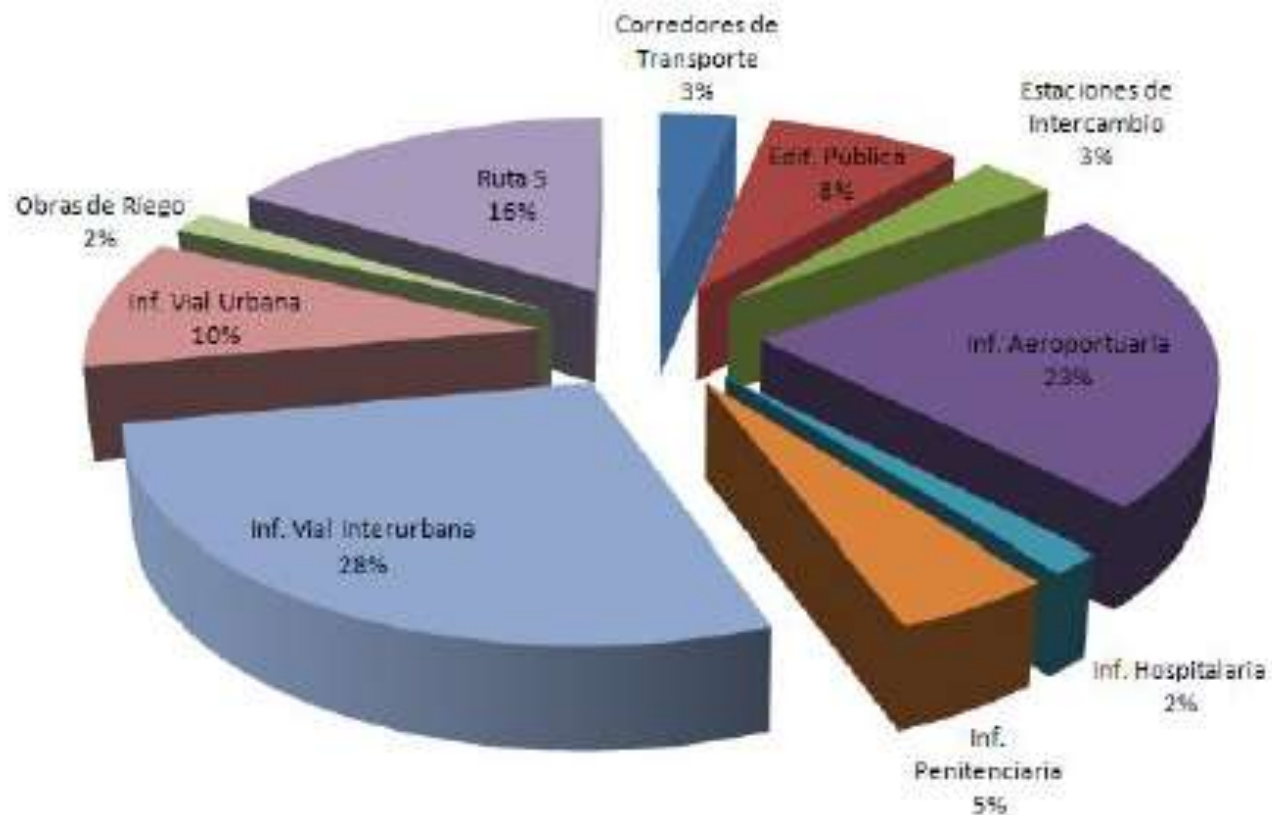
# Lean Construction in Chile

## Public sector



### CONCESIONES

62 PROJECT FOR APPROX. BILLIONS US\$ 12.000





# Lean Construction in Chile

## Public sector



### **PUBLIC PRIVATE INITIATIVES**

- In the last 20 years more than 12 billion dollars in projects under a Law developed for this purpose. Highways, hospitals, channels, airports, etc.

### **CONTRACTUAL REQUIREMENTS**

- Government companies such as METRO, and CODELCO have specified in their contract documents that their contractors should use the Last Planner System
- Hospital projects are now required to be designed and constructed using BIM.

### **MAJOR PROGRESS**

- CODELCO, world largest copper producer, is requiring that its contractors use the Last Planner System and participate in collaborative improvement initiatives.
- CODELCO has extended the Terms to the most effective contractors.
- It has incorporated contract clauses present in IPD contracts that promote collaboration... But it has maintained traditional ones that prevent collaboration...

# Lean Construction in Chile

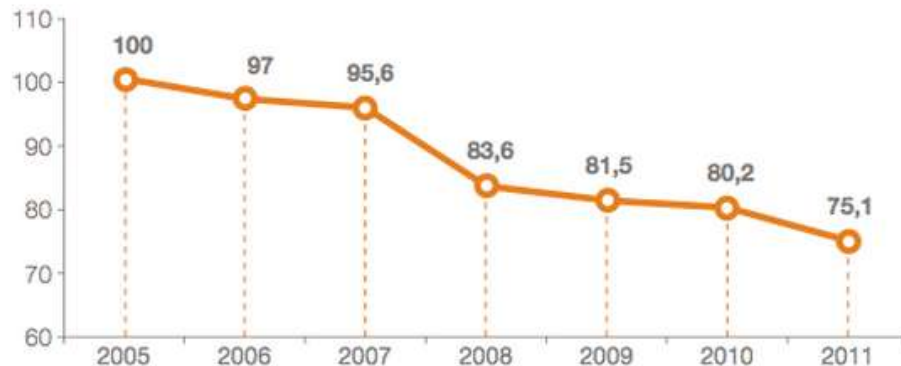


## Public Sector - Lean in Mining (\*): A Case Study

### Context and Motivation

#### Labor Productivity in Mining 2005-2011

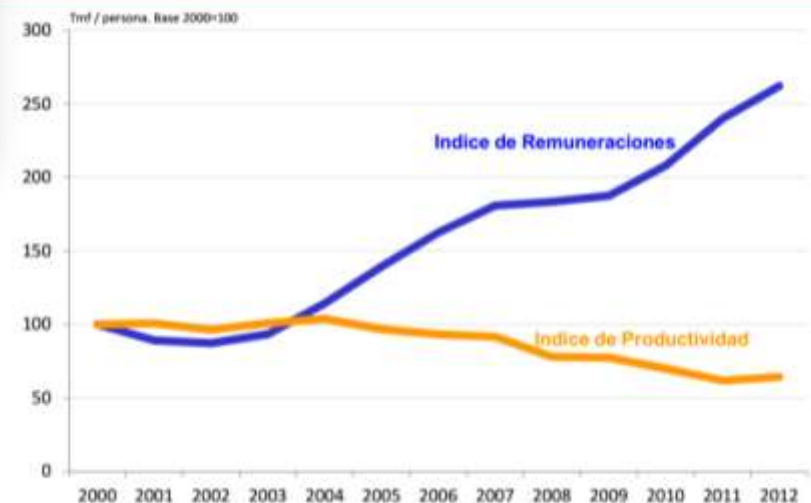
Índice de productividad laboral de la gran minería 2005-2011



Consejo Minero, a partir de información de Cochilco y Sernageomin



#### Productivity vs Salaries 2000-2012



Nota: Índice de Remuneraciones para Codelco corresponde a remuneraciones, resto de Chile corresponde a la estimación del costo de la mano de obra publicada por Visión Maquinaria.  
Fuente: Visión Maquinaria y Codelco

Castillo G., Alarcón L.F. and González V.A. (2015) Implementing Lean Production in Copper Mining Development Projects: Case Study. *Journal of Construction Engineering and Management-ASCE*, 141, 1, 05014013-1-11.

# Lean Construction in Chile

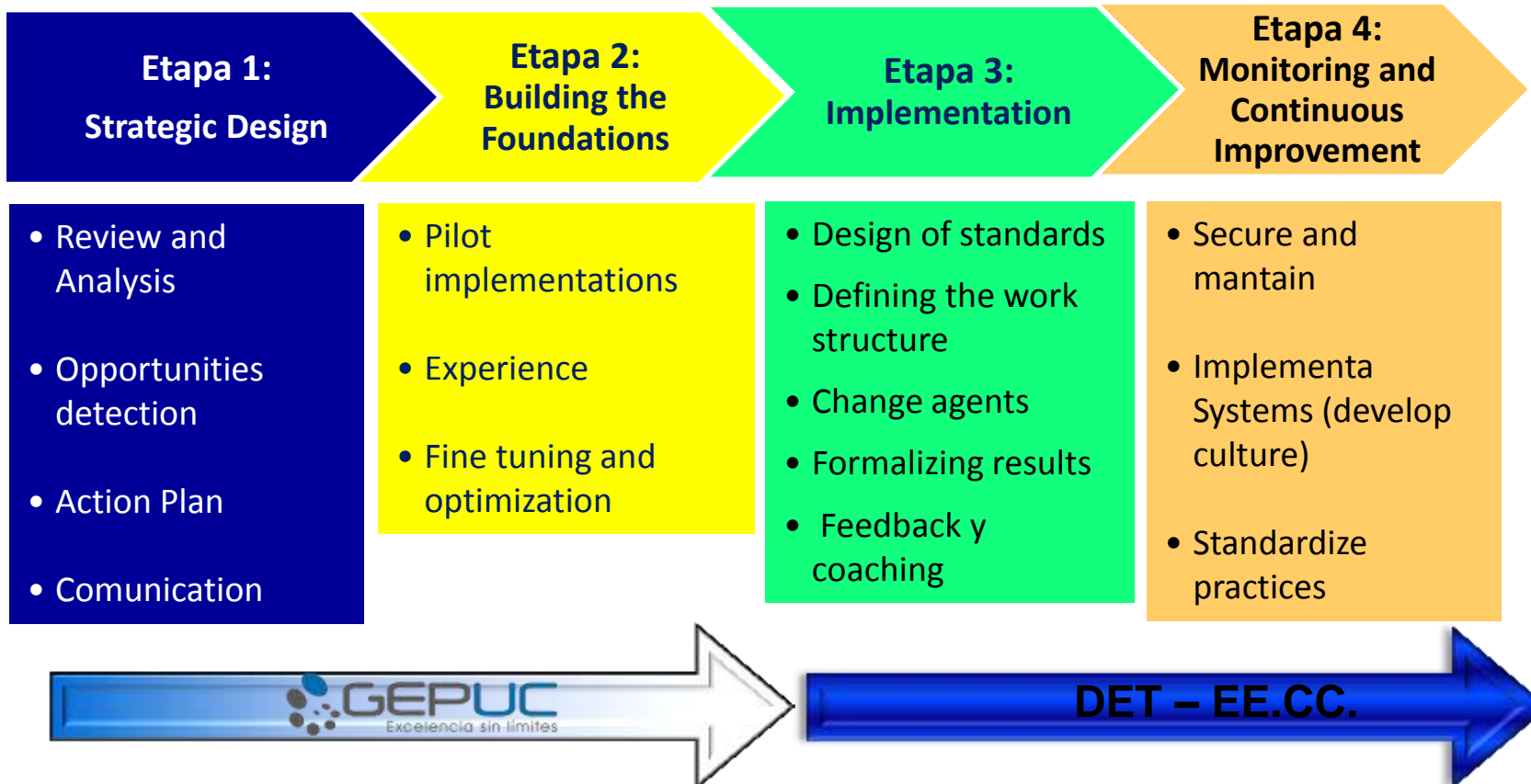


## Implementation Plan for a Codelco Copper Mine

**Fase I**



**Fase II**



# Lean Construction in Chile

## Training for action



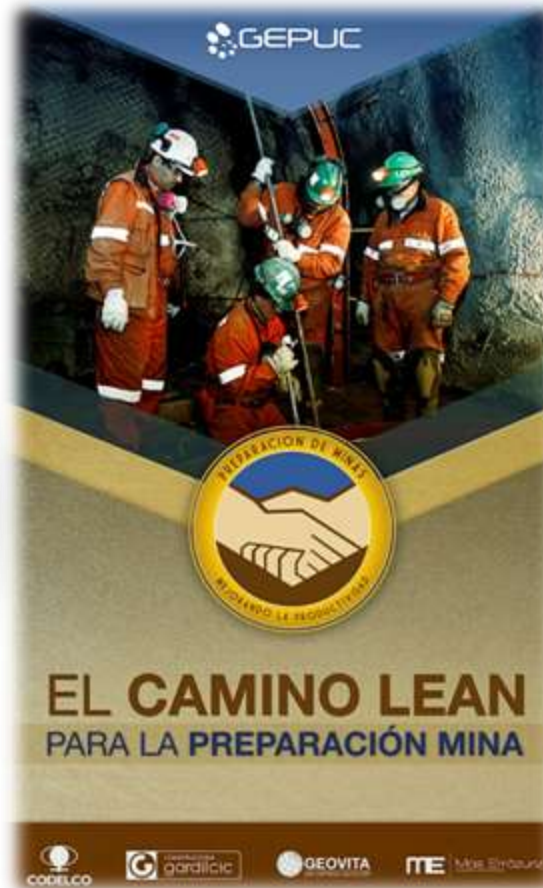
Lean philosophy  
Last Planner System®.  
Interactive planning  
5 S  
Value Stream Mapping  
Waste identification and reduction  
Lessons Learned.





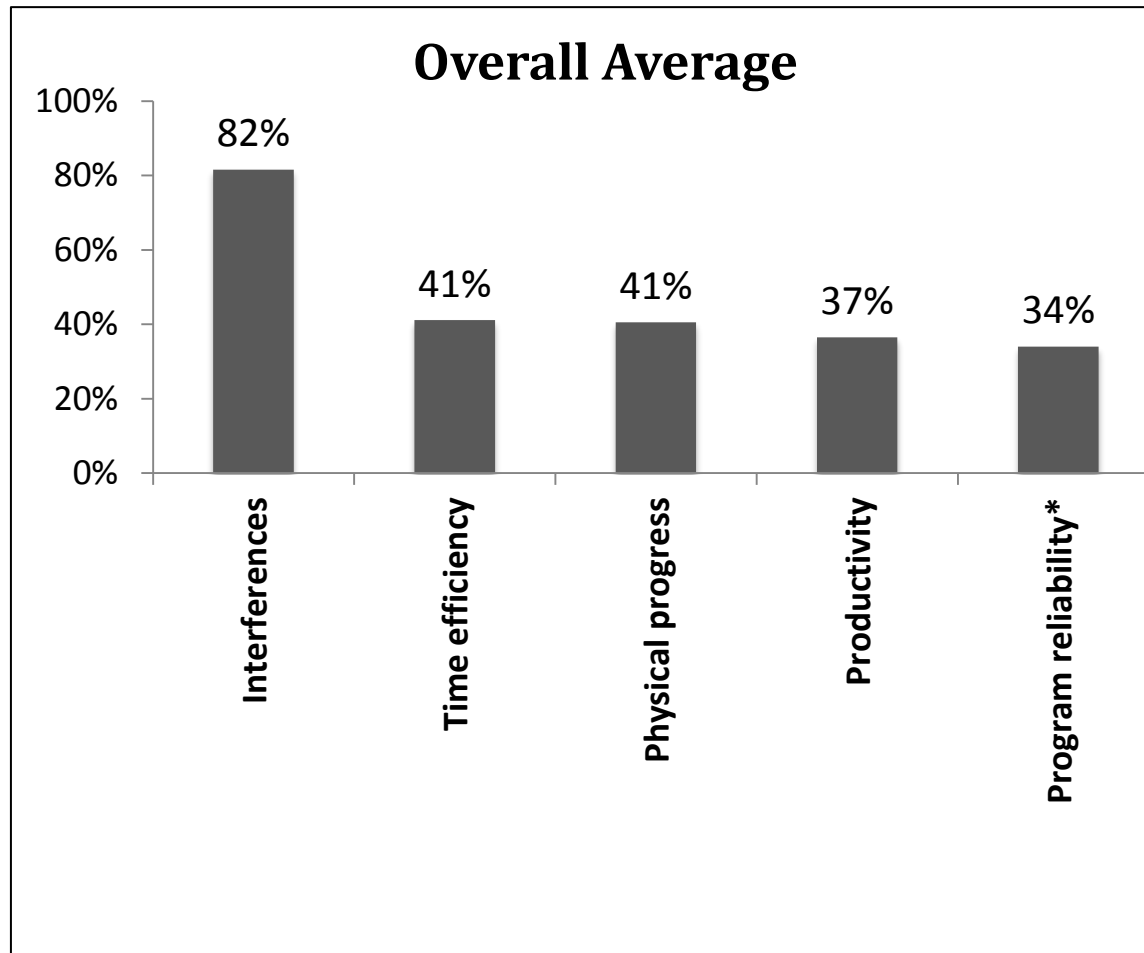
# Lean Construction in Chile

## Communication Plan



# Lean Construction in Chile

## Results



# Lean Construction in Chile

## Results



- The implementation of lean production, applied during the mining development projects, presented statistically significant improvements in performance of projects as measured by their process indicators.
- Today, there is a new initiative in two mines of the same company that are expected to be a model for future implementation
- The implementation has been the result of step by step changes in contractual requirements to allow collaborative implementation of Lean but using traditional contracts.

# Lean Construction in South America

## Main conclusions

- No IPD contracts yet in public sector. In Peru, private owners are promoting adaptations of IPD.
- In general, private sector adopting lean tools and BIM but no shift in philosophy. Brazil has ~15 years of lean implementation – mainly to public housing.
- Chile – government is requiring lean practices in contractor organizations.
- Brazil – consultancy companies are promoting lean practices while the government is requiring more accountability.
- Colombia is showing willingness to adopt IPD but trust seems to be still an issue.
- Youth of countries and legal systems is a challenge to implement lean and change forms of contracting.