ROMA07
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PER UN MONDO SOSTENIBILE
TECNOLOGIE – APPLICAZIONI E
NUOVI MERCATI

iSTT

Renzo Chirulli

Inefficency Level
an adimensional index in the
Indirect Generalized Costs comparisons

September the 10th, 2007

Any work on underground utilities affects the urban environment.

The effects degree depends on the way of execution of the work

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How can we measure the effects of these works <u>on urban envirnonment?</u>

COSTS

direct costs *(construction cost)*

the amount of money that the contracting subject spends to do the work.

indirect costs

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Most of the effects on the urban environment, generated by works on underground utilities, are related with **Indirect Costs**

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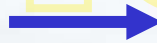
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Indirect Generalized Cost Analysis
IGCA

✓ *First calculation model was published in 1998 by R. Chirulli and A. Caruso - Polytechnic of Bari, Italy*

✓ *A second updated version of the calculation model was published in 2003 by R. Chirulli*

✓ *Final version of the method was published in the handbook "Progetto No-Dig" in the year 2005 – by R. Chirulli*

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IGCA <u>monetizes</u> effects on:

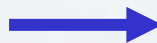**Interferences with mobility**

→
- traffic delay/block
- road destruction degree

C_i = *costs of the interference with transport infrastructures*

Interferences with economical and residential activities

→
- local economical losses
- people discomfort

(due to: noise, air pollution, danger sensation, interference with residential areas)

C_s = *social costs*

IGCA's main result

$$IGC = C_i + C_s$$

represents the sum of the underlined extra-costs that, compared with the undisturbed state of a given component (specifically a road) of the urban system , community and city administration have to pay because of the effects of a job site on that given component .
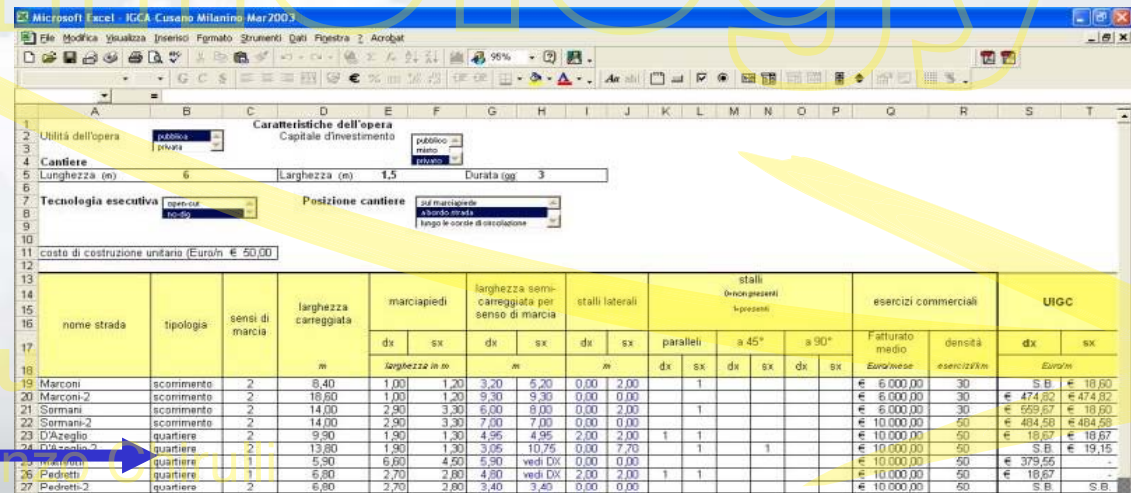
Note that IGC represents the whole amount of the monetizable effects/impacts[*]

(*) Environmental impacts are not monetized. They have to be evaluated by an Environmental Assessment

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Although IGCA leads to a solid effects evaluation, unfortunately this approach crashes against the current mentality of Public Administrators and Managers of Private/Public Utilities

At the moment, City modelization by IGCA allows to calculate the indirect generalized cost (IGC) of a single job site by considering its size, duration and technology

(open-cut or No-Dig)

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No-Dig Tech Researcher

effective promotion
of more sustainable
technologies

(Trenchless Technology)

current mentality

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comparison between effects and/or impacts, generated by different technologies, can be effectively carried out by using an adimensional index, avoiding to expressly monetize effects and/or impacts.

Any given component of an urban system presents a specific efficiency level, related to the standard "functioning" of the component when no job site is in progress.

When a job site affects that component (specifically an urban road) then a *lower efficiency level* (corresponding to an higher inefficiency level – IL) occurs.

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Let's note that: $IGC = C_i + C_s$

where: $C_i = \beta \cdot (C_{mtp} + C_{mc} + C_{tv} + C_{is} + C_{dv}) + C_{pco}$ and $C_s = \beta \cdot (C_{de} + C_d)$

for the detailed formulation of each term of C_i and C_s see:
*R. Chirulli – "**Progetto No-Dig**" – **Vol. 1**, Editrice La Fiaccola – Milano, Italy – 2005.*

According to its formulation, IGC is the sum of the <u>extra-costs</u> that, compared with the undisturbed state of a given component of the system, community and city administration have to pay because of the effects of the job site on that given component <u>(specifically an urban road).</u>

The **cost without inefficiency** of the same component C_{wi} represents the whole cost related with the functioning of a given component (specifically an urban road) during a given period of time (specifically the duration of the job site).

For a given urban road, C_{wi} can be formulated as the sum of:

- cost of mobility (travel time cost, fuel cost)
- cost of parking (along the road)
- social cost of car accidents (along the given road)
- travel discomfort
- road maintenance costs

All this costs have to be calculated for the duration of the job site.

Based on the definitions of IGC and C_{wi}, **inefficiency level - IL** can be formulated as following:

$$IL = \frac{IGC}{IGC + C_{wi}} \cdot 100\%$$

According to this formulation **IL** represents an adimensional index of the inefficiency level generated by a job site into a given component (specifically a road) of an urban system.

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Thank you for your attention.

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