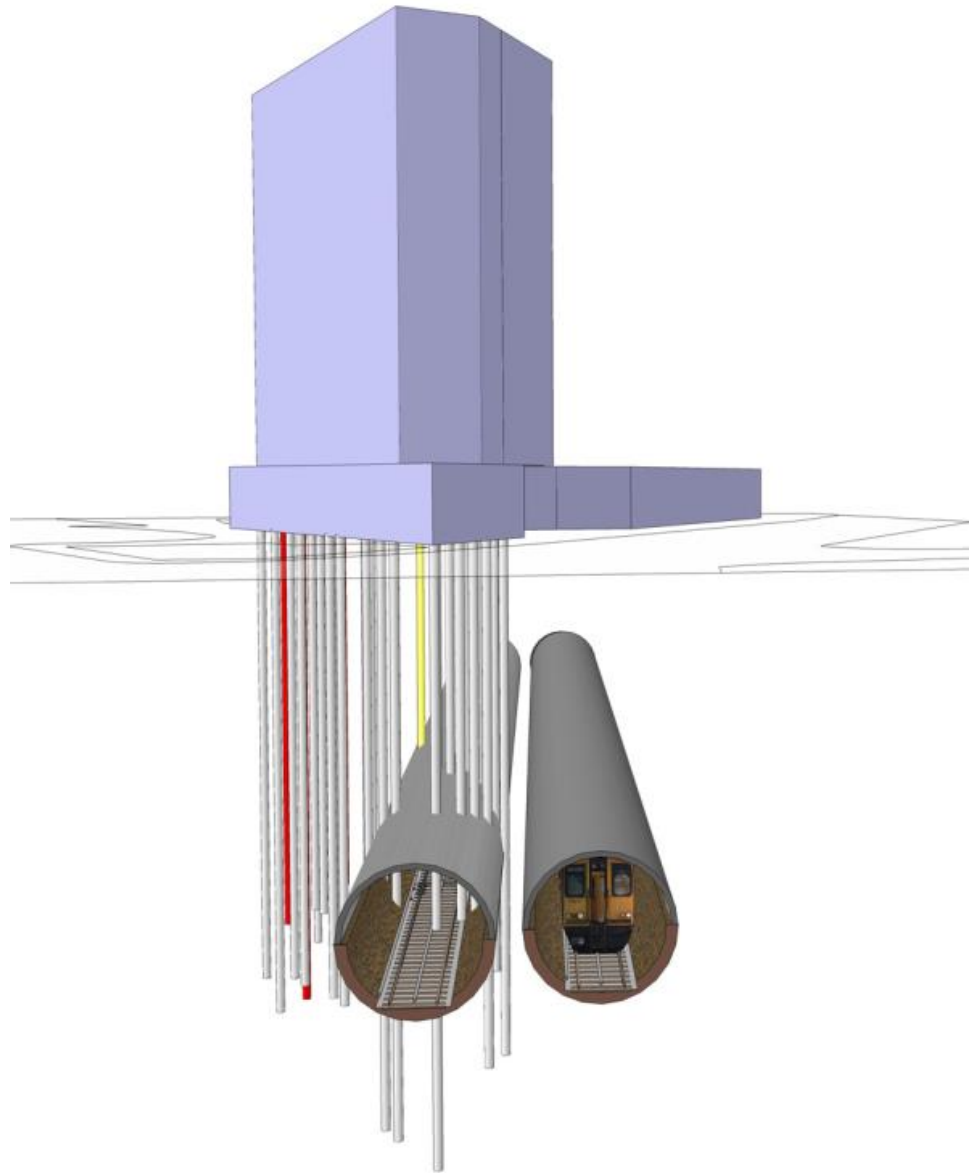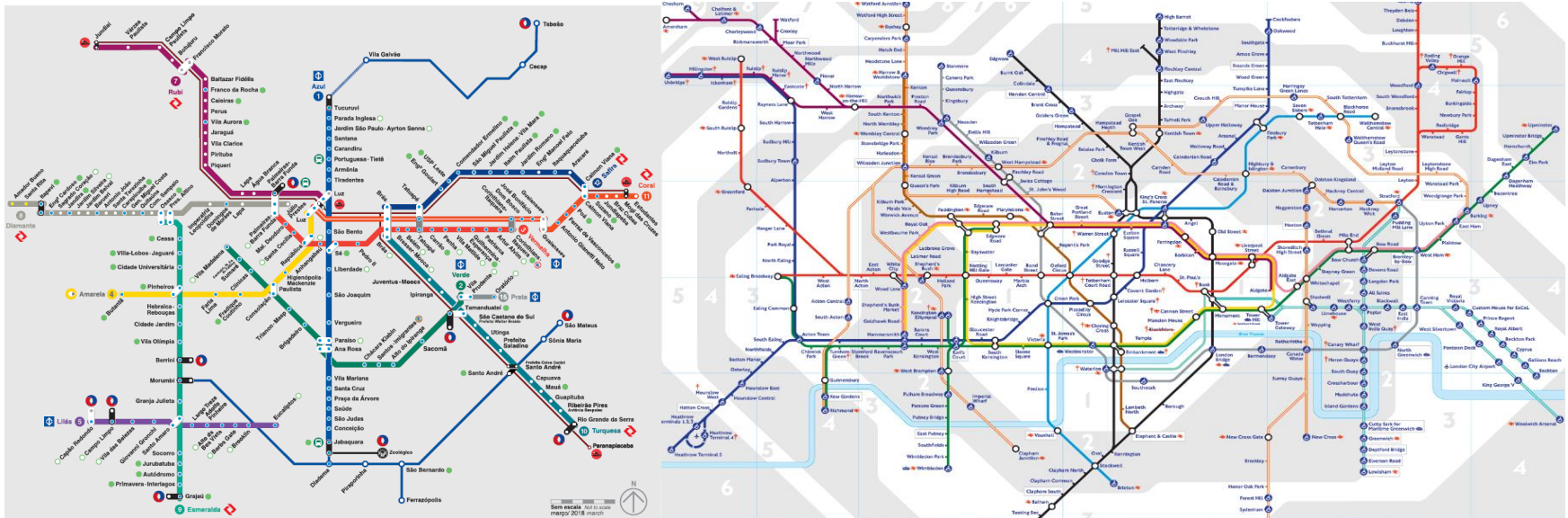# A conceptual framework to understand urban underground metro infrastructure and its environment.

Presented by Nathan Darroch MA MIAM, at Metropolitano de São Paulo, Brazil, 9 May 2018.
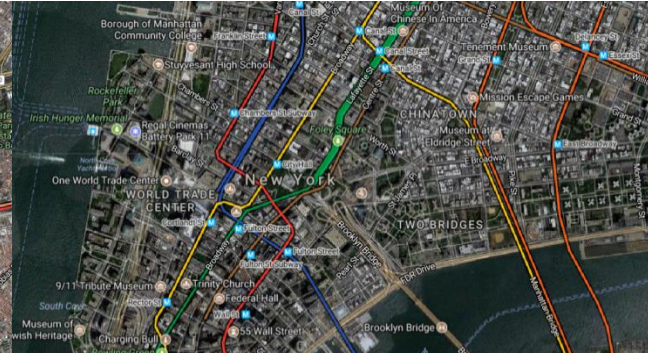
Metros are becoming more and more important for moving people within cities, globally.
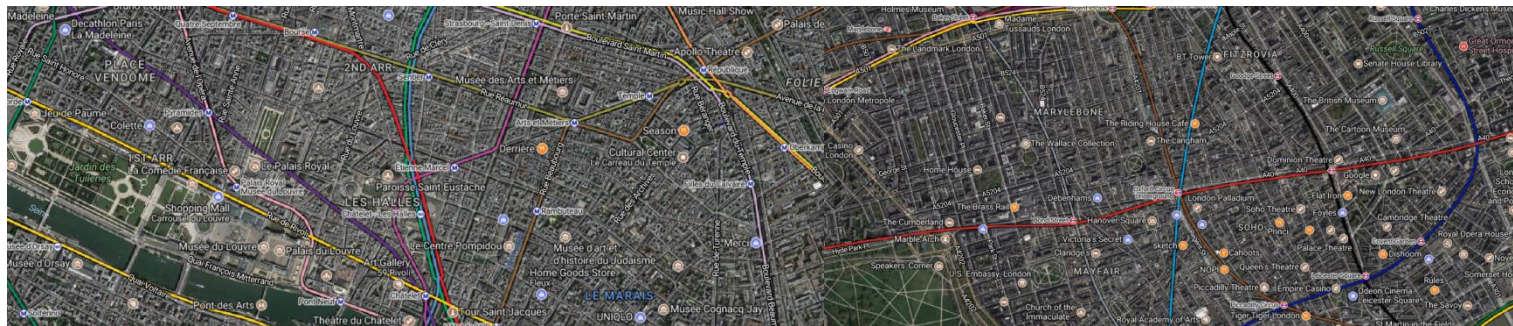
These metros create hundreds of thousands of interfaces with their urban environment...


Sao Paulo, Brazil


New York, US

Paris, France

London, UK

Note: These google images (*Google, 2017*) do not show the accurate alignments of any of the metro systems represented, nor do they give a full picture of the interfaces of urban metros and their environment. But they do show the dense urban environments of cities with metro systems.
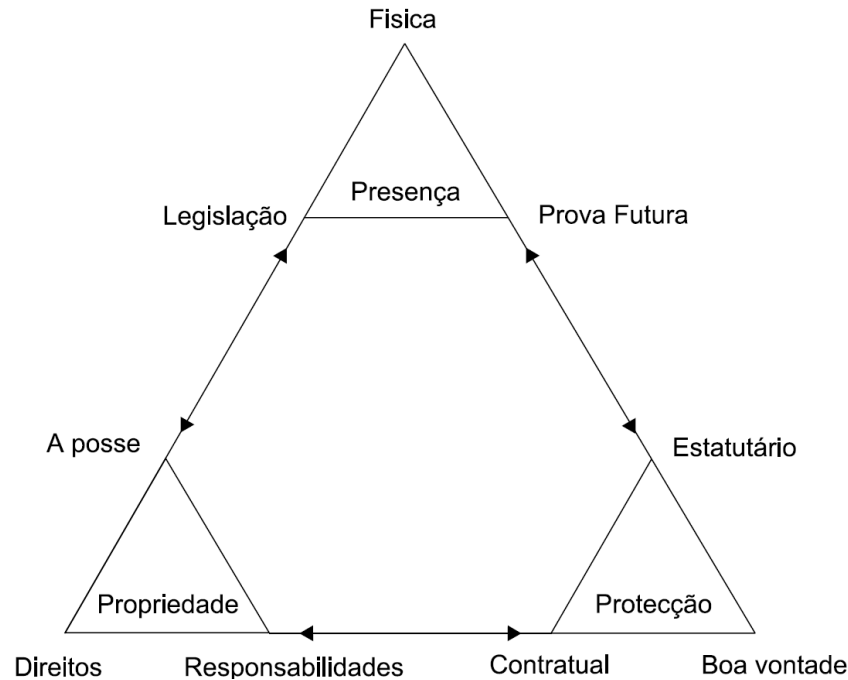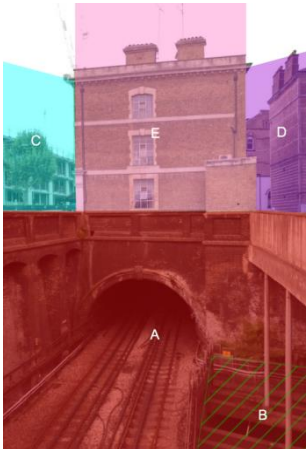
...these interfaces must be fully understood and managed effectively…

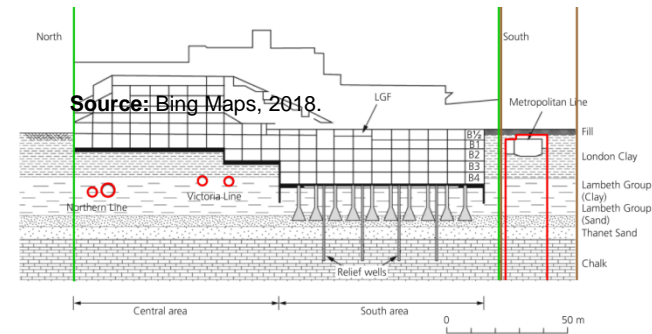# ...but they are not always obvious.
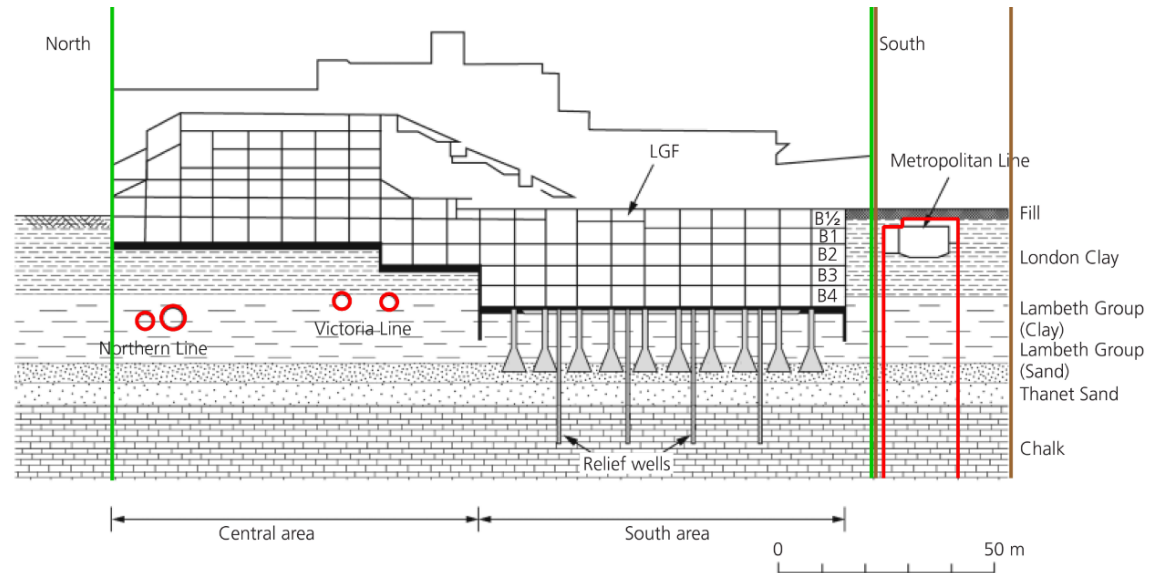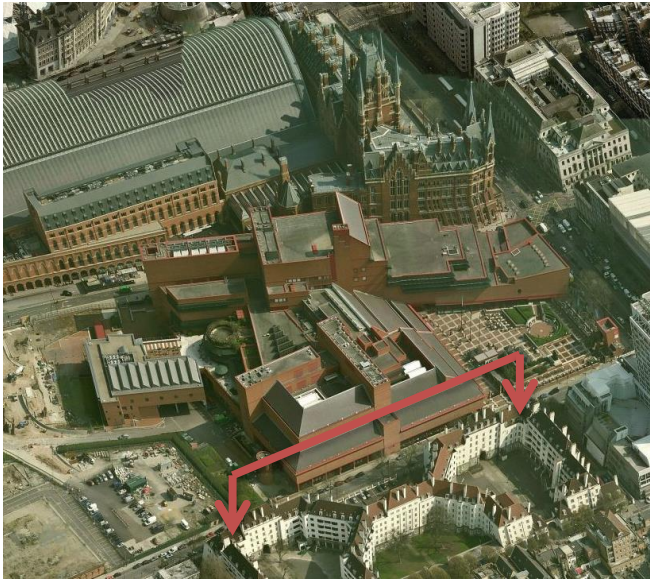
We need a way to understand these interfaces and how they affect and are affected by their environment.

Source: *Photograph:* Nathan Darroch;
Property data: London Underground

Física

Presença

Legislação   Prova Futura

A posse   Estatutário

Propriedade   Protecção

Direitos   Responsabilidades   Contratual   Boa vontade

Source: Darroch, et al, 2016.

Source: Bing Maps, 2018.

Source: Simpson, and Vardanega, 2014.

Failure to do so has serious consequences.
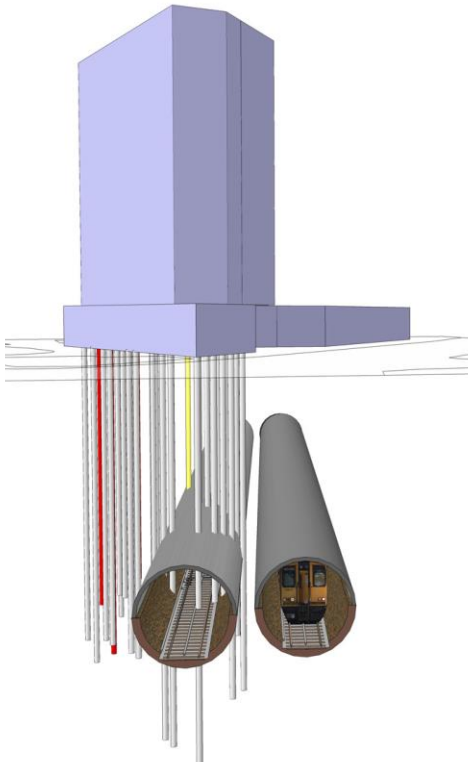
What is the research?

The research uses three scenarios to identify **presence** interfaces (<u>*what is*</u> *there?* tunnels; shafts; ventilation; stations; ticket halls; entrances):
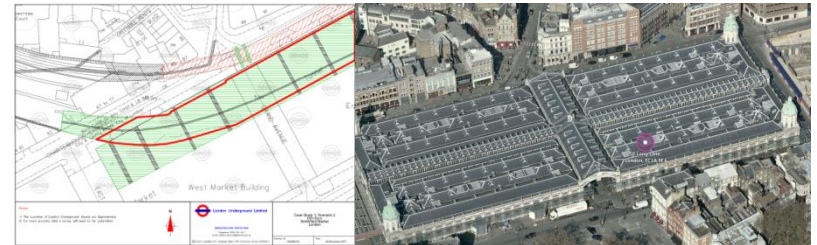
- Under public highway

Charterhouse Street, Smithfield, London

- Under a building

Smithfield Market, London

- Within a building

67-87-Charterhouse Street, Smithfield, London

Sources: London Underground; Bing Maps, 2018.

What is the research?

The research uses three scenarios to identify **property** interfaces (_who owns/maintains_ _what is there?_ Metro de São Paulo; Leaseholder; Concession holder; private party):

- Under public highway

- Under a building

- Within a building
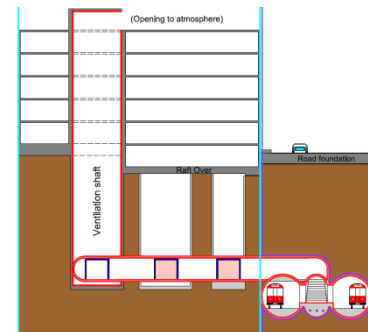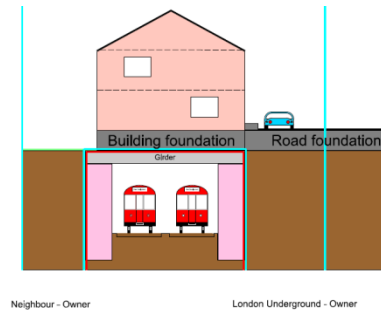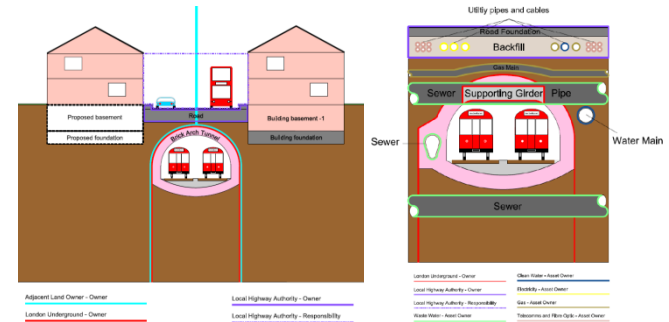
What is the research?

The research uses three scenarios to identify ***protection*** interfaces (<u>*how is what is there protected?*</u> tunnels; shafts; ventilation; stations; ticket halls; entrances):
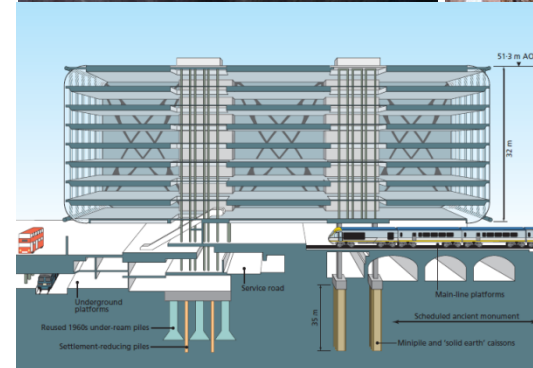
- Under public highway

Park Royal, bridge over railway.
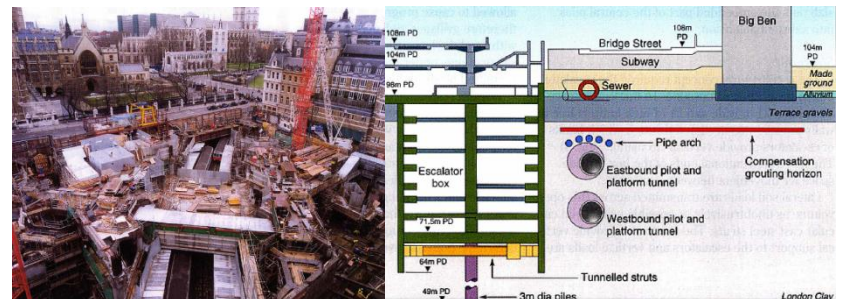**Source:** London Underground, 2009.

- Under a building

Canon Place, Over Station development.
Source: Fraser, et al, 2012.

- Within a building

Portcullis House and Westminster Station development.
Source: Bailey et al. 2000.

Why is it Metro de São Paulo relevant to the research?

Source: RAIB, 2014.
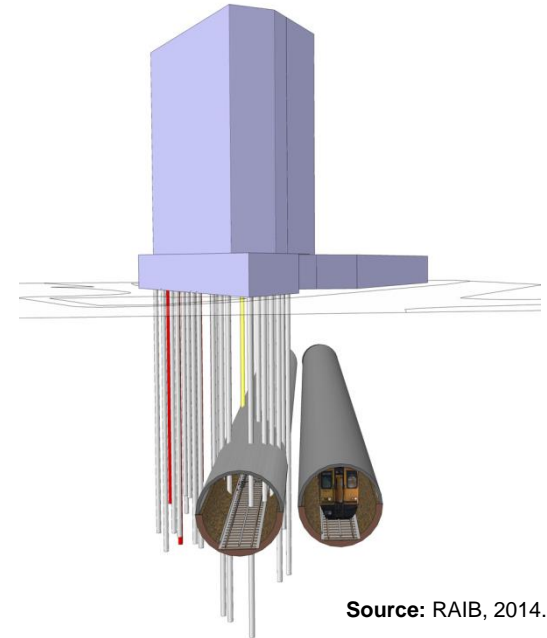
- São Paulo is densely developed and keeps expanding – out, up, and down.

- To move people effectively the existing Metro system is also expanding.

- This expansion increases the interfaces between the metro and its environment.

- Both must be and are managed effectively.

But we need to asses the interfaces within context.

Operacionalizando o quadro conceptual
um exemplo de contribuição para o gerenciamento de ativos
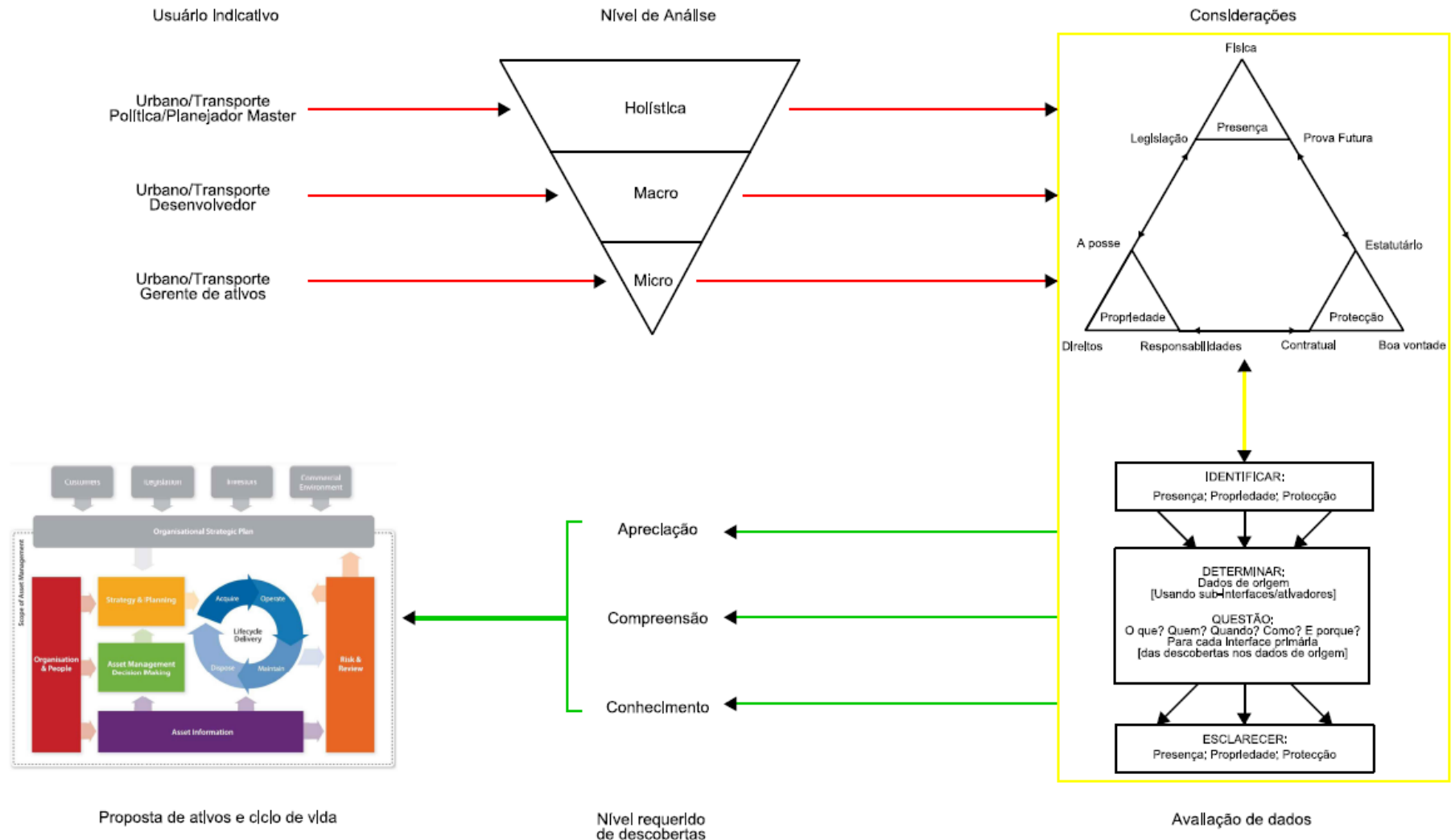
There are different requirements for decision making:
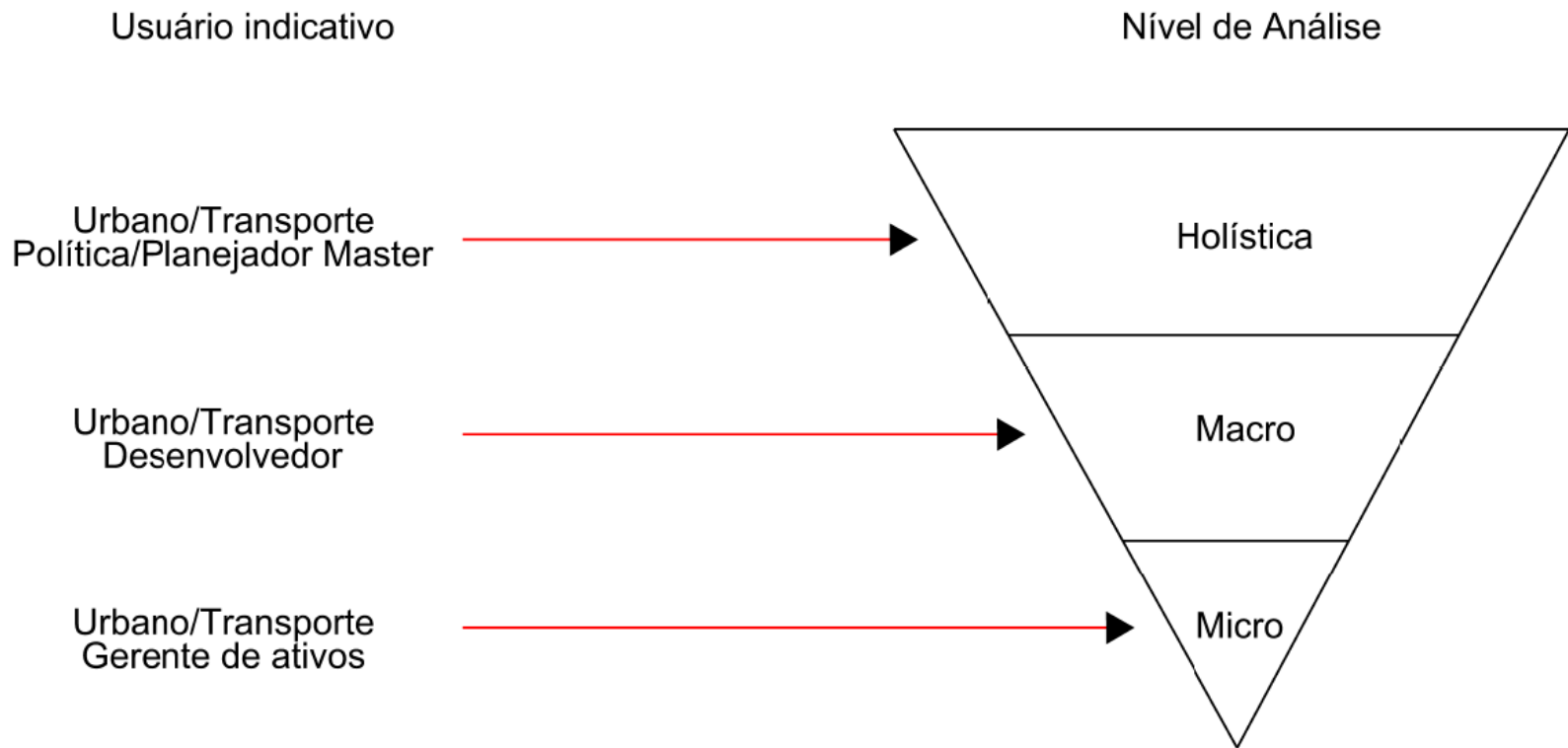
All need to consider the interfaces within the conceptual framework:

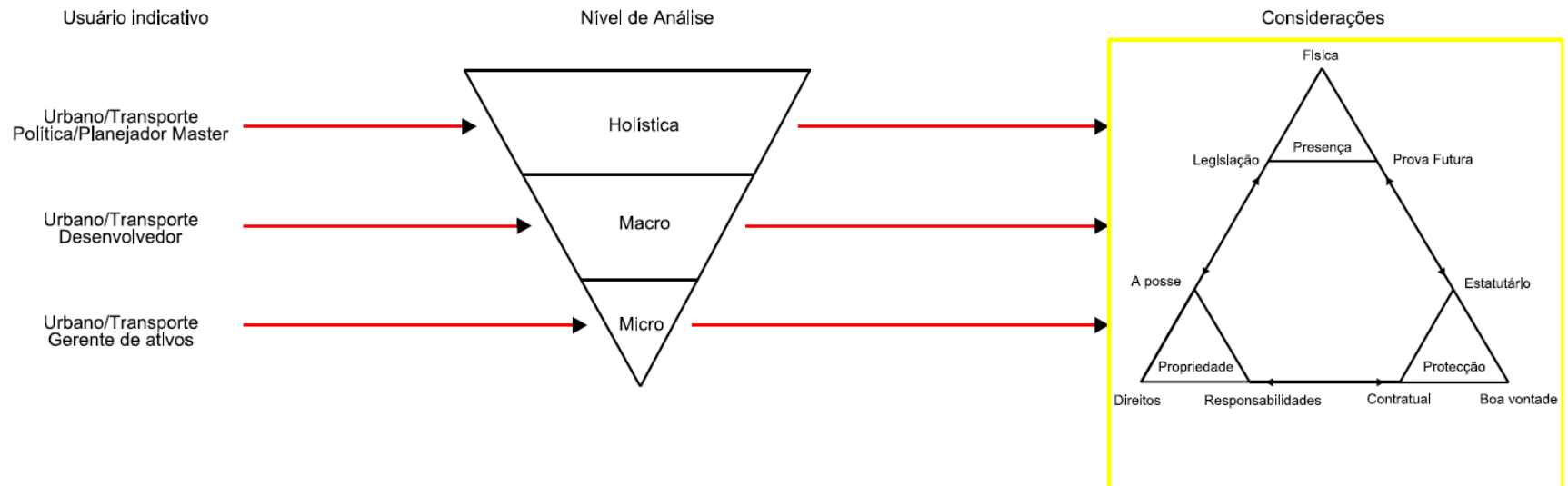The conceptual framework showing the three primary interfaces and nine sub-interfaces/enablers:
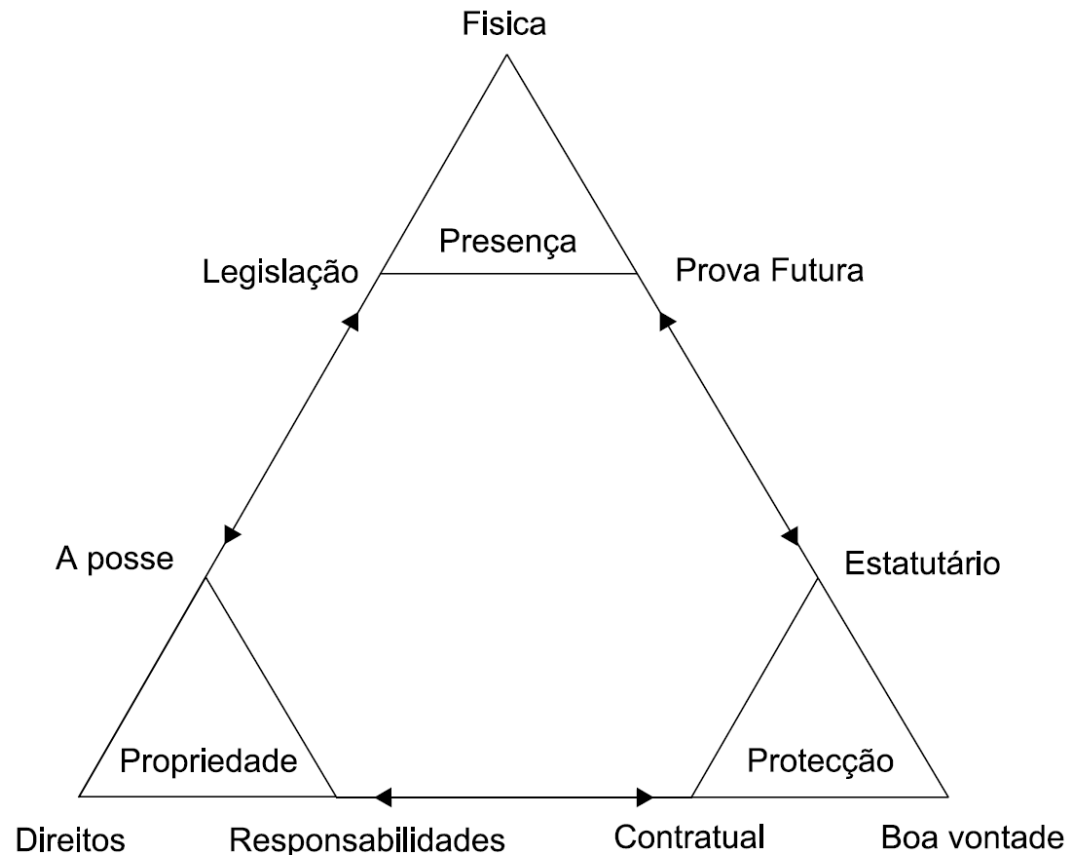
Source: Darroch, N., Beecroft, M., & Nelson, J., 2016. A conceptual framework for land use and metro infrastructure. *Journal of Infrastructure Asset Management*. [e-journal] 3(4). 122-131. Available through: ICE Virtual Library <https://doi.org/10.1680/jinam.16.00008> [Accessed 9 May 2018].

Questions must be asked of the conceptual framework:
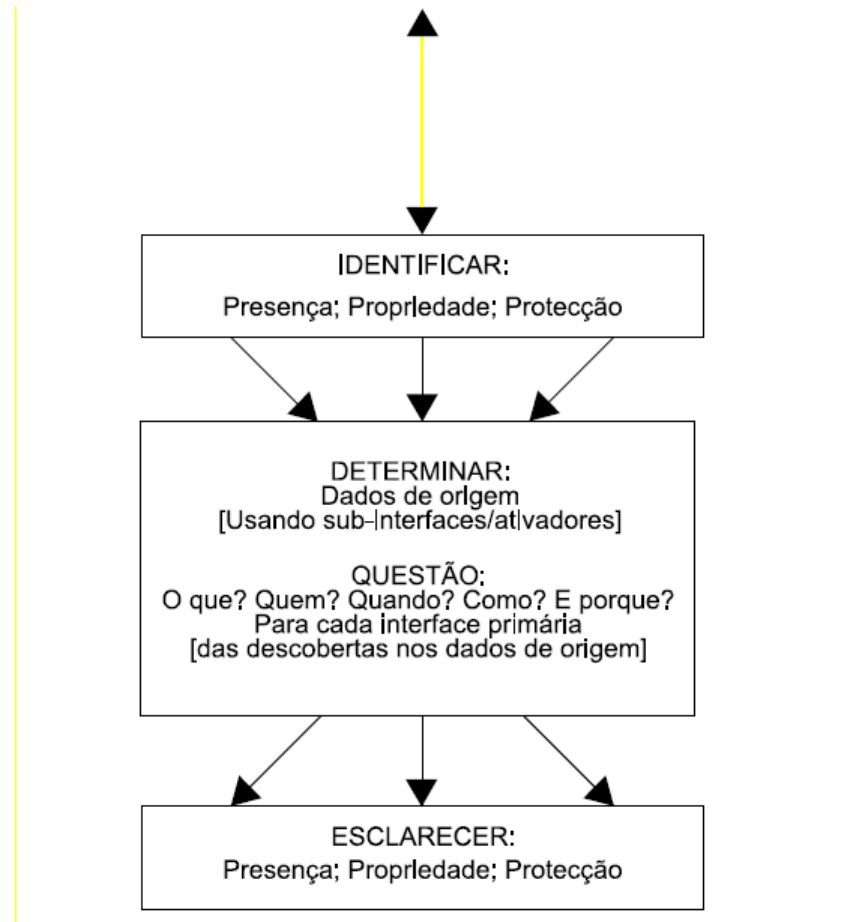
Avaliação de dados

These questions are asked of each interface:

This enables development of a *level of finding*:

Apreciação

Compreensão

Conhecimento

Nível requerido
de descobertas

IDENTIFICAR:
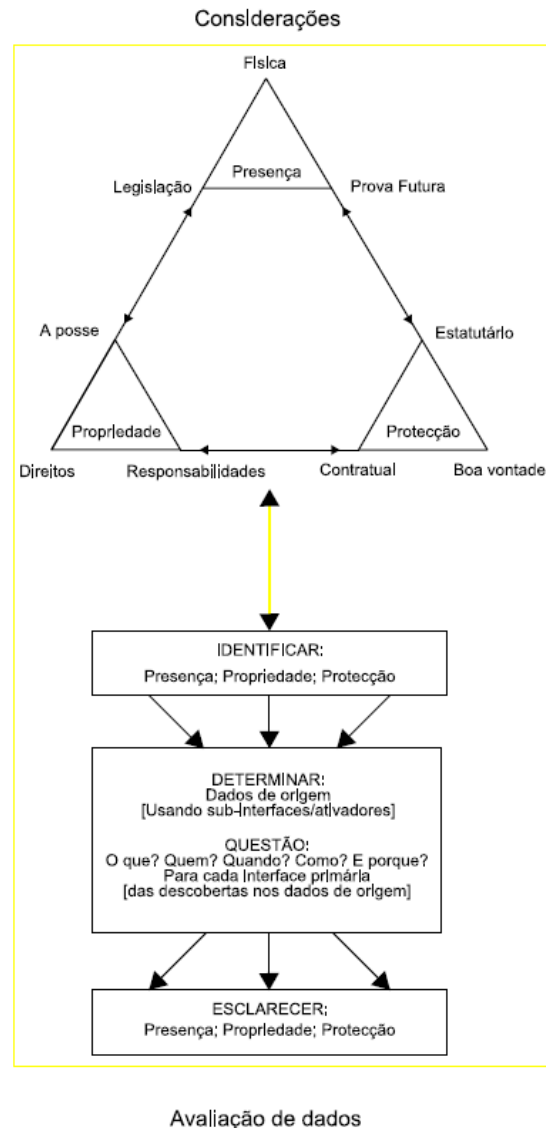Presença; Propriedade; Protecção

DETERMINAR:
Dados de origem
[Usando sub-interfaces/ativadores]

QUESTÃO:
O que? Quem? Quando? Como? E porque?
Para cada interface primária
[das descobertas nos dados de origem]

ESCLARECER:
Presença; Propriedade; Protecção

Avaliação de dados
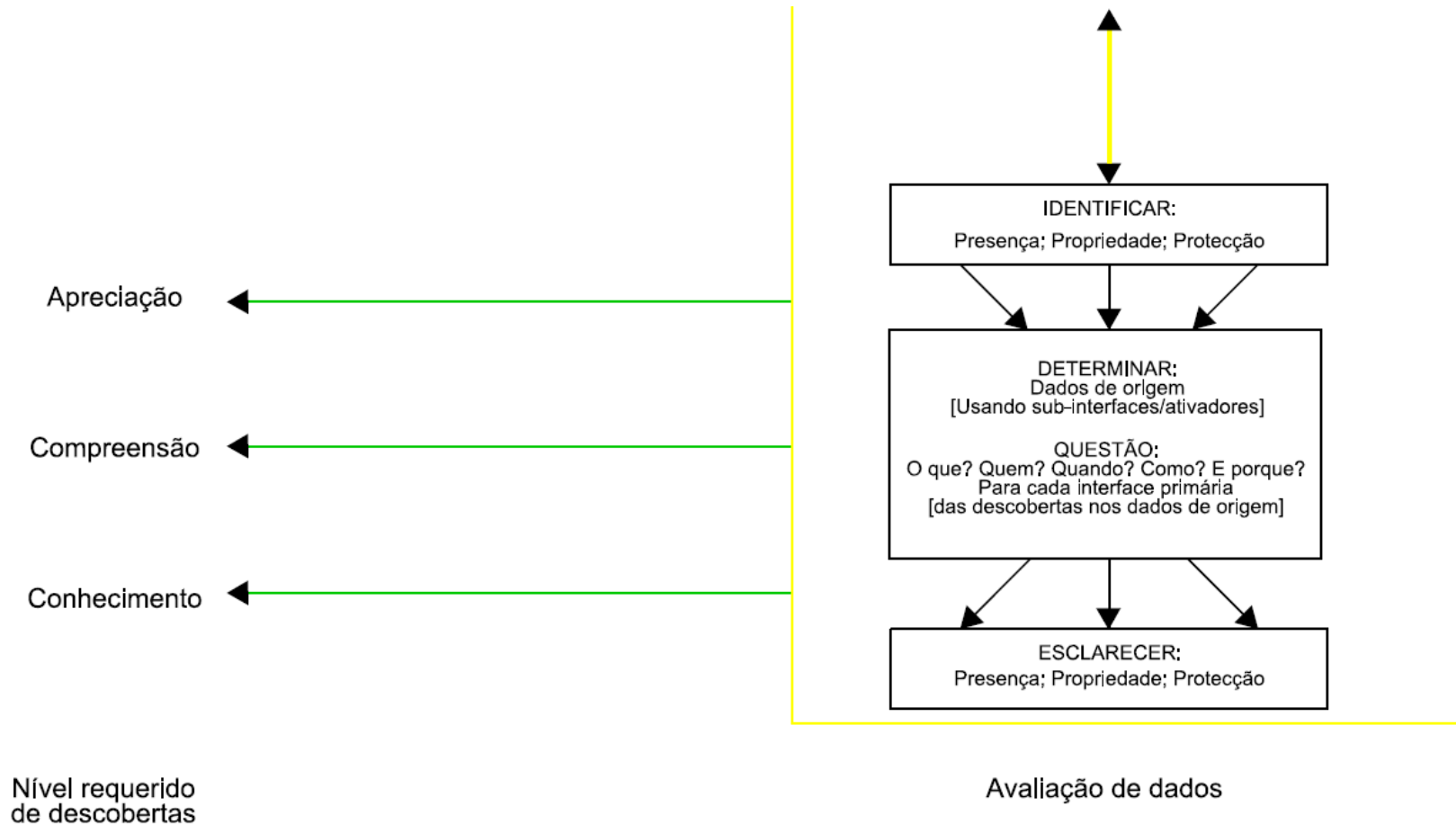
The *findings* are applied to the urban/metro asset work stream:

Identifique uma necessidade/beneficio

Proposta

Viabilidade

Concelto

Legislação/Permissão

Planejamento

Detalhe

Construção

Vestlng
(de propriedade, direitos e responsabilidades de ativos)

Operatlon

Mudança/Demollção/Reconstrução/Retlrada/Re-vestlng

Proposta de ativos e ciclo de vida

Apreclação

Compreensão

Conheclmento

Nível requerldo
de descobertas

IDENTIFICAR:
Presença; Proprledade; Protecção

DETERMINAR:
Dados de orlgem
[Usando sub-Interfaces/atlvadores]

QUESTÃO:
O que? Quem? Quando? Como? E porque?
Para cada Interface prlmárla
[das descobertas nos dados de orlgem]

ESCLARECER:
Presença; Proprledade; Protecção

Avallação de dados

19

By following this workflow metro and urban can be: planned; designed; constructed; allocated; managed; operated; maintained; re-allocated; and replaced, effectively.

Operacionalizando o quadro conceptual
um exemplo de contribuição para o gerenciamento de ativos
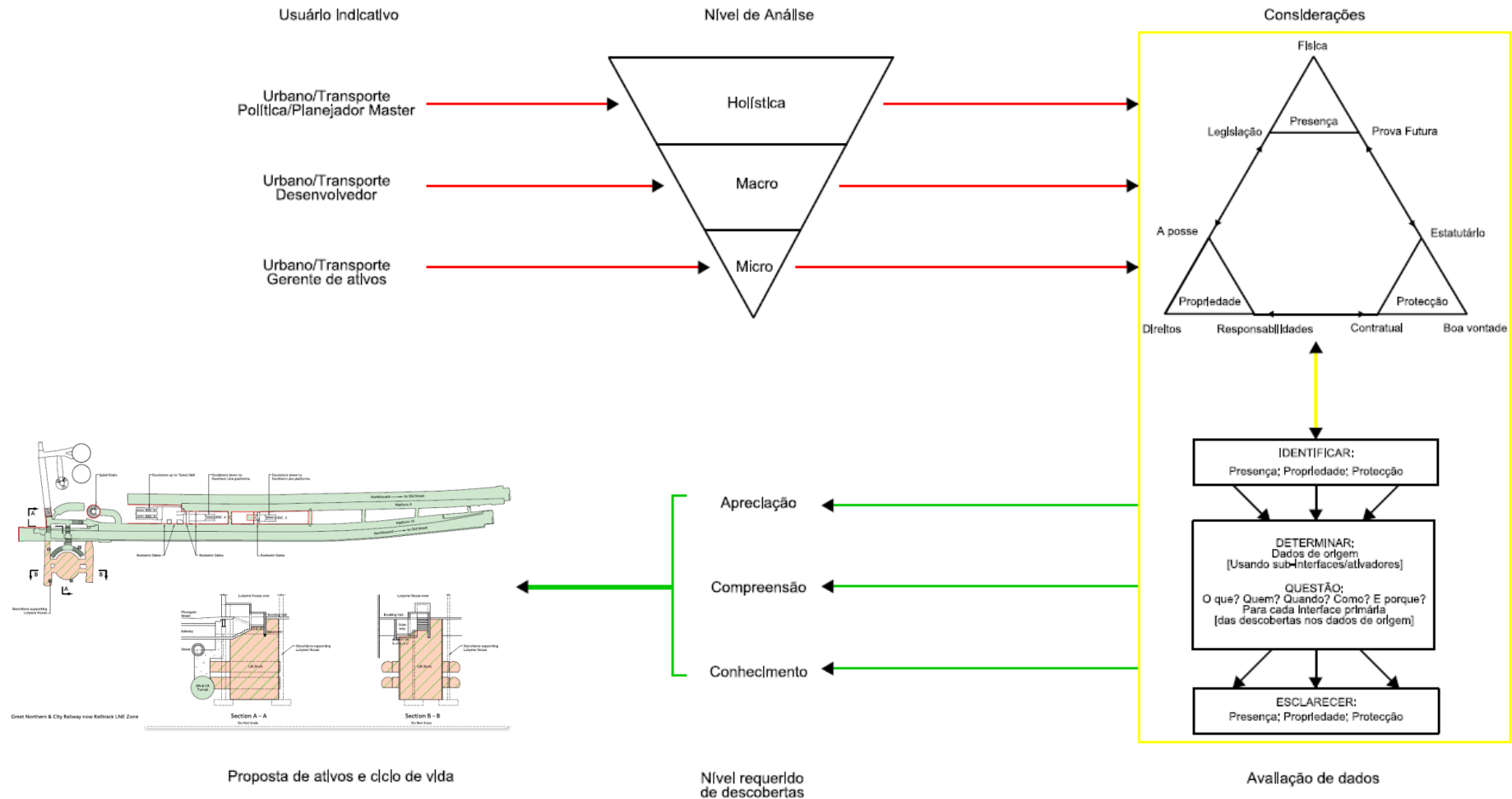
This minimises short and long term costs and risk to urban and metro interfaces; ensuring they are, and can be, managed effectively:
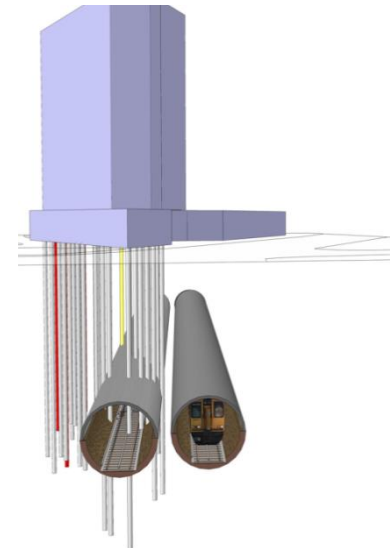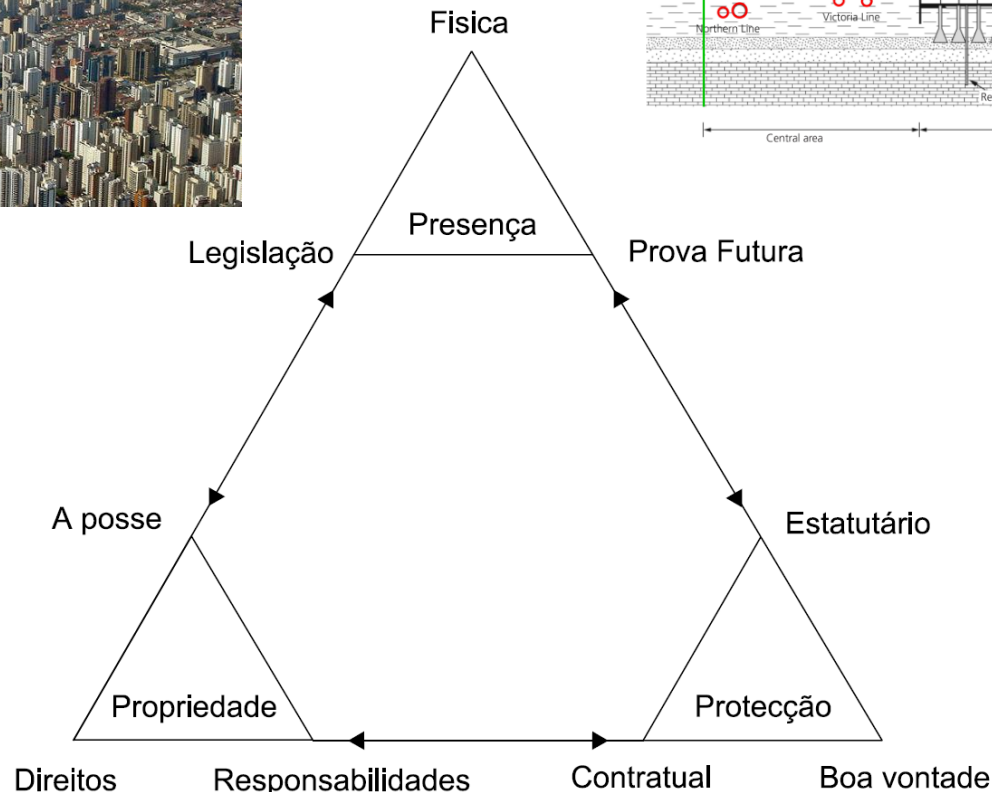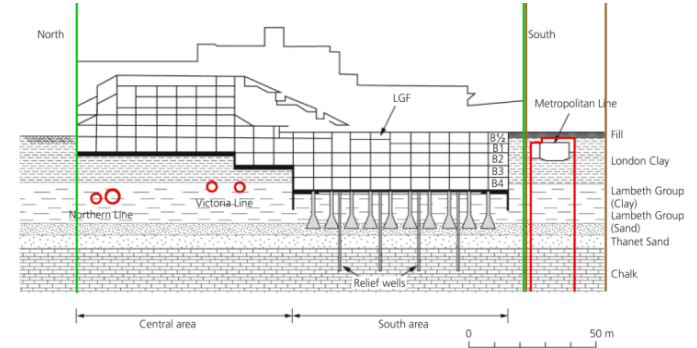
Questionas or comentes

What do you think?

Is it relevant?

Is it something you already do?

Have you documented your processes?

What can we do together?