



JT-ITRA. Planificación sostenible de las infraestructuras de transporte.

EVALUACIÓN DE LA SOSTENIBILIDAD EN LAS INFRAESTRUCTURAS. INDICADORES

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Evaluación de la sostenibilidad en las infraestructuras. Indicadores

Congreso Nacional del Medio Ambiente
Cumbre del Desarrollo Sostenible
Del 1 al 5 de diciembre de 2008

Ponente: **Antonio Burgueño Muñoz**
Director Servicio Calidad y Medio Ambiente
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Sostenibilidad

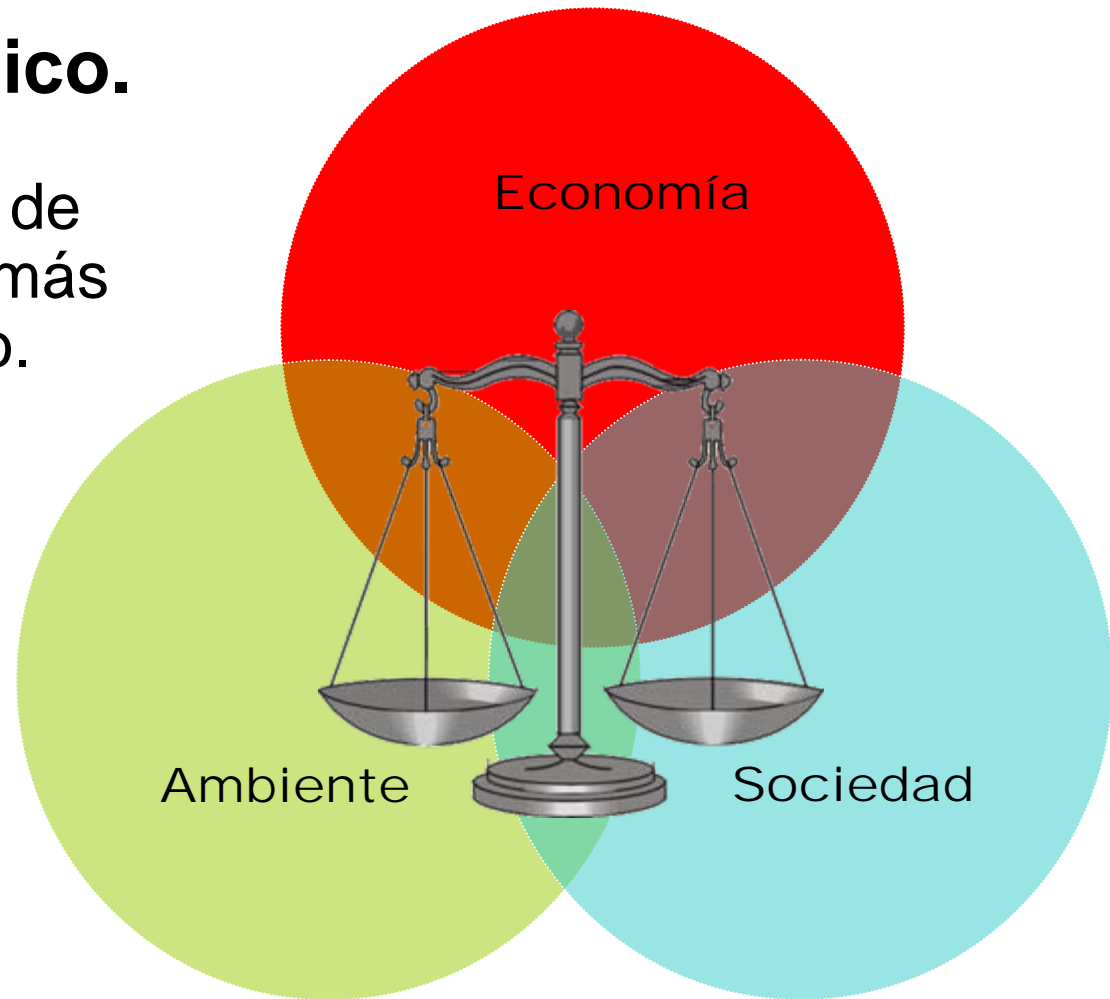
Equilibrio entre los aspectos social, ambiental y económico.

Ello supone la necesidad de compensar los aspectos más débiles en cada momento.

Concepto dinámico

En el espacio

En el tiempo



Criterios de construcción sostenible

Comité Técnico ISO/TC 59/SC 17 “Building Construction/
Sustainability in building construction”

se estructura en grupos de trabajo:

Working Group 1: General Principles and Terminology

Working Group 2: Sustainability Indicators

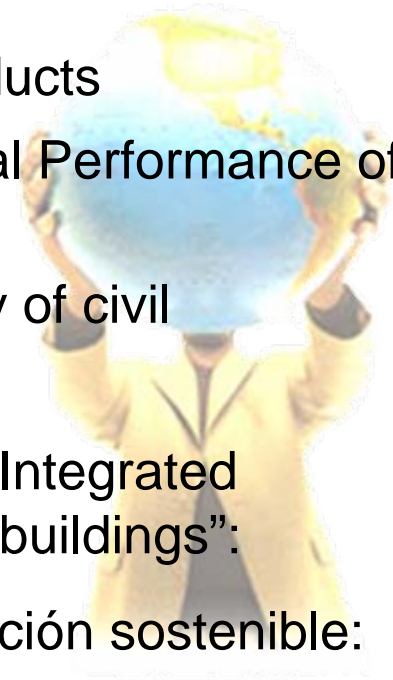
Working Group 3: Environmental Declarations of Building Products

Working Group 4: Framework for Assessment of Environmental Performance of
Buildings and Constructed Assets

Working Group 5: Sustainability of civil
engineering works

Comité Técnico **CEN/TC 350** "Integrated
environmental performance of buildings”:

AEN/CTN 198/SC 2 “Construcción sostenible:
Obra Civil”



Objetivos y principios generales

- 1. Mejora continua
- 2. Equidad
- 3. Pensamiento global y acción local
- 4. Aproximación holística
- 5. Responsabilidad
- 6. Implicación de los agentes interesados
- 7. Largo plazo
- 8. Precaución y riesgo
- 9. Transparencia



Desarrollo de los trabajos

Definición de
INDICADORES

Métodos de **EVALUACIÓN**
DE LA SOSTENIBILIDAD



Enfoque de
CICLO DE VIDA

Indicadores

Uso

- Conocer la situación
- Tomar decisiones
- Planificar actuaciones
- Realizar seguimiento
- Informar a las partes interesadas

Infraestructura

Materiales

Procesos de construcción



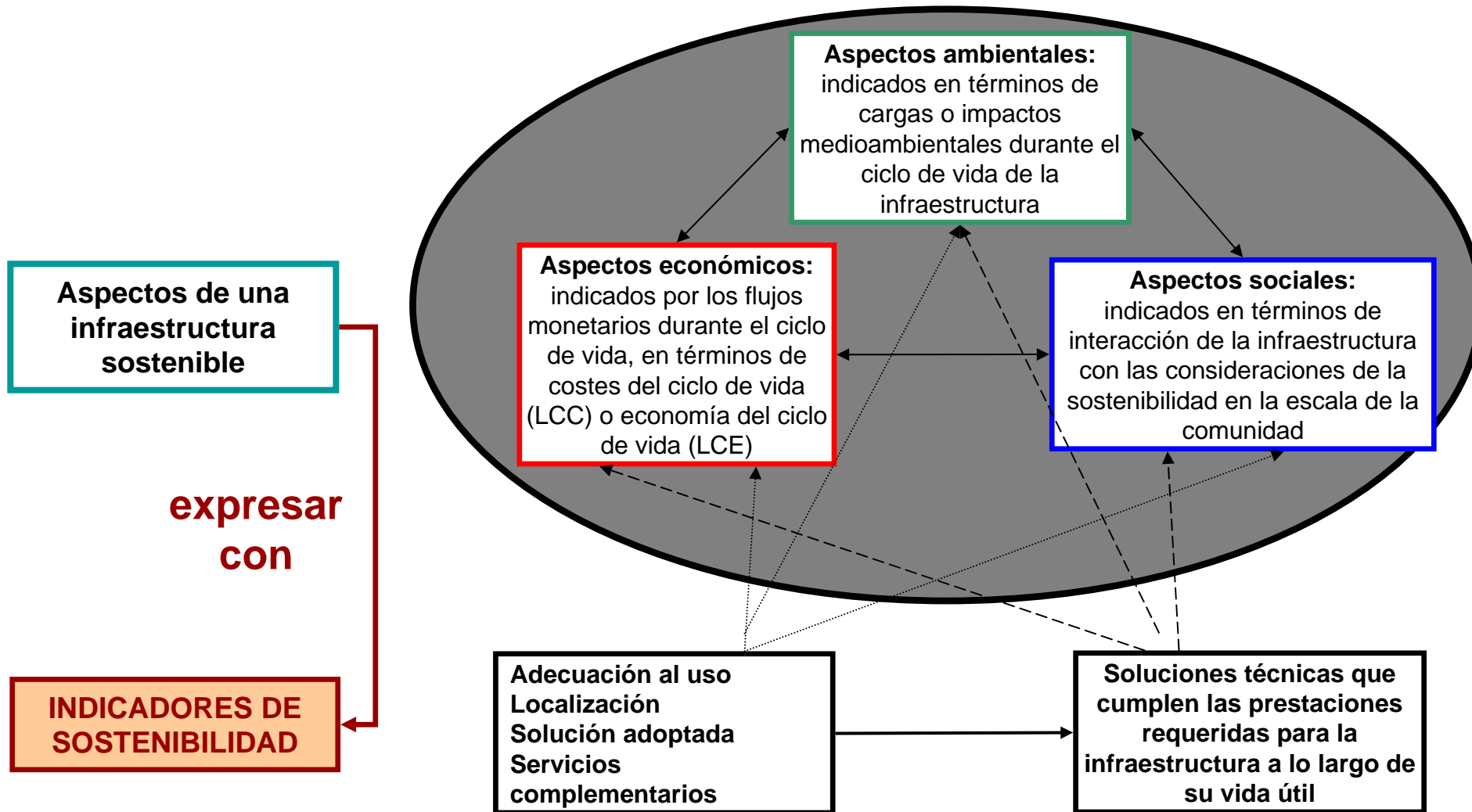
indicador

Cuantifica
Simplifica
Comunica

Indicadores. Estructura


- **Uso de recursos naturales**
 - Materiales
 - Agua
 - Energía
 - Usos del suelo
- **Contaminación ambiental**
 - Atmósfera
 - Ruido y vibraciones
 - Agua
 - Suelo
- **Residuos**
 - Generación de residuos
 - Gestión de residuos
- **Biodiversidad y paisaje**
 - Especies y ecosistema
 - Paisaje
- **Repercusión económica**
 - Costes directos
 - Beneficios directos
 - Efectos económicos indirectos
- **Sistema territorial**
 - Planeamiento urbano y territorial
 - Relaciones territoriales y conectividad
- **Demografía / Población**
 - Dinámica poblacional
 - Empleo
 - Patrimonio cultural
- **Inclusión social**
 - Accesibilidad al uso de la infraestructura
 - Participación pública
- **Seguridad**
 - Desastres naturales
 - Oportunidades tecnológicas
 - Desastres causados por accidentes o terrorismo
 - Riesgos derivados de condiciones y métodos constructivos
- **Salud y confort**
 - Condiciones de vida
 - Comportamiento social
 - Acceso a servicios básicos

Indicadores. Relación





Indicadores



ISO/TC 59/ SC 17
Building Sustainability Indicators for Construction/
Civil Engineering Works
WG 5 Civil Engineering Works

Conyenor:
Antonio Asevilla (asevilla@fcc.es)
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Definición del indicador

Unidad

Cálculo / Explicación

Date: 2008-08-11
Reference number: ISO/TC 59/SC 17 N XXX
Supersedes document: ISO/TC 59/SC 17 / WG 5 N 013

Supersedes document:
This document is still under study and subject to change. It should not be used for reference purposes.

REQUESTED ACTION
To be circulated to WG5 members and to other SC17/WG convenors, as well as to SC17 secretariat

Approved on 2008-09-17 in Melbourne
WG 2 & 5 meeting on 2008-09-17 in Melbourne

Title:
Indicators collection for civil engineering works

Code	Indicator	Unit	Calculation / Explanation	Source	Construction	Deconstruction
1.2. Water	1224	Water consumption	hm ³ /year	Calculation or measurements of the annual water consumption of the infrastructure; data collection of the water consumption in the catchment basin where the construction work is comprised. Calculation of the percentage of the infrastructure water demand in the total catchment basin consumption.	Moratala, F. (14) + FCCCO	x x x x x x x
	1225	Intensity of use of water resources	%	$\frac{\text{withdrawal of water resources} \times 100}{\text{renewal of water resources}}$	OECD (15)	x x x x x x x
	1226	Water from the municipal supply net	%	$\frac{\text{Water from the municipal supply net}}{\text{total annual water consumption}}$ Note: To adapt this indicator, the affected population would refer to the local residents or to the people which can be influenced by the civil engineering work. For instance, if a channelling system is built, it may increase the population in the nearby areas and consequently the water consumption coming from the municipal supply net.	Tortajada, R. (20) adapted	x x x x x x x
	1227	Water supply efficiency		$\frac{W_s - W_r}{W_s} \times 100$, where: • W _s = annual water consumption which is effectively registered. • W _r = annual volume of water which is supplied to the water supply system.	Tortajada, R. (20)	x x x x x x x
	1228	Water resources used	3 year	Calculation or measurements of total annual volume of groundwater and surface water withdrawn from their sources by the civil engineering work.	UNEP (21) + FCCCO	x x x x x x x
1. Energy	1301	Vehicles with MOT	%	Percentage of vehicles with a current MOT which ensures that the vehicle is properly maintained and complies with certain important law requirements.	AENOR (22) + FCCCO	x x x x x x x
	1302	Fuel used for machinery	lit	lit real consumption = 100 - 100 x $\frac{\text{lit estimated fuel consumption}}{\text{lit real consumption}}$	AENOR (22) + FCCCO	x x x x x x x
1. Energy	1303	Fuel substitution	Points	Substitution of fossil fuel uses as energy source for the machinery working in civil engineering boundaries by other alternative energy sources such as solar or bioethanol.	AENOR (22) + FCCCO	x x x x x x x
	1304	Energy savings	kWh	kWh of energy saved through the use of construction regulations and design decisions.	IEA (23) + FCCCO	x x x x x x x
	1305	Energy source substitution	%	$\frac{RE - E}{E} \times 100$ • RE: Renewable energy consumption • E: Total energy consumption (from renewable and non-renewable energy sources)	IEA (23) + FCCCO	x x x x x x x
	1306	Petrol and diesel consumption	litre (kt of oil eq.)	Calculation or measurements of petrol and diesel consumption by the civil engineering work.	FCCCO (24)	x x x x x x x
	1307	Energy consumption	kWh / year	Calculation or measurements of the annual energy consumption by the civil engineering work.	AENOR (22) + FCCCO	x x x x x x x
	1308	Final energy consumption	litre (kt of oil eq.)	Calculation or measurements of the total final energy consumption per year (including all natural gas, electricity, renewable energy sources).	IEA (23) + FCCCO	x x x x x x x
	1309	Ecoefficiency	%	$\frac{\text{annual profit}}{\text{annual energy consumption}}$ Total final energy that is used yearly in the civil engineering work related to the net profit that is derived from the infrastructure in its different phases.	IEA (23) + FCCCO	x x x x x x x
	1310	Primary energy consumption	litre (kt of oil eq.)	Calculation or measurements of the consumption of primary energy (coal, lignite and derivatives) + kt oil (crude oil and derivatives) + kt gas (natural gas, liquefied natural gas, biogas, geothermal, hydropower and wind energy).	IEA (23) + FCCCO	x x x x x x x
	1311	Renewable primary energy consumption	%	$\frac{\text{renewable energy used} \times 100}{\text{primary energy used}}$	IEA (23)	x x x x x x x
	1312	Percentage of covered vehicles	%	Percentage of vehicles fueled by liquefied natural gas which are used for the civil engineering work performance.	FCCCO	x x x x x x x
	1313	Intensity of energy use	Yes / no Points	Existence of considerations during the design phase in order to reduce the energy consumption during construction, maintenance, demolition and disposal according to norms and other practices.	FIDIC (25)	x x x x x x x
1.3. Energy	1314	Intensity of use of renewable energy resources	Yes / no Points	Existence of considerations during the design phase in order to use renewable energy resources during construction, maintenance, demolition and disposal according to norms and other practices.	FIDIC (25)	x x x x x x x
	1315	Total energy consumption	GJ	Calculation or measurements of the infrastructure's consumption of primary energy sources (both directly and indirectly through the supply of electricity, heat or steam).	GRJ (12) adapted	x x x x x x x
	1316	Energy saved	GJ	Calculation or measurements of the total amount of energy saved during engineering work and its influence areas due to the efficiency of processes and other energy	GRJ (12)	x x x x x x x
	1317	Energy consumption	kWh / year and inhabitant	Calculation or measurements of the annual energy amount used by the civil engineering work.	Hernández, A. (12)	x x x x x x x
	1318	Energy efficiency	kwh and inhabitant	Calculation or measurements of the annual energy amount used by the civil engineering work.	Hernández, A. (12)	x x x x x x x
	1319	Changes in the uses of energy	%	Calculation or measurements of the annual energy amount used by the civil engineering work.	Hernández, A. (12) + FCCCO	x x x x x x x
	1320	Energy consumption of the street lighting	kWh / inhabitant	Calculation or measurements of the annual energy consumption of the street lighting. Note: To adapt this indicator, we must consider the population located, as well as its municipal area and the annual electric consumption of the infrastructure requires in its different phases.	Hernández, A. (12) + FCCCO	x x x x x x x
	1321	Annual energy consumption	t of oil equivalent / year	Calculation or measurements of the annual energy consumption of the infrastructure requires in its different phases.	Hernández, A. (12) + FCCCO	x x x x x x x
	1322	Energy intensity of transport	t of oil equivalent (toe) / km	Energy use per unit of freight-kilometre, considering operations, activities and transport of the machinery and vehicles of the civil engineering work.	Hernández, A. (12) + FCCCO	x x x x x x x

Más de 500 indicadores de partida

Categorías según tipos de infraestructuras

Necesidad de depuración y selección

Estructura:

Evaluación de la sostenibilidad

- Ponderación
 - En la selección de los indicadores
 - En las unidades elegidas y la forma de medir
 - En el proceso de evaluación

Valores límite / Elementos inaceptables

Objetiva

Replicable

Verificable...



CARRETERAS

FFCC

AEROPUERTOS

URBANIZACIONES

CANALIZACIONES

ENERGÉTICAS

OBRAS MARÍTIMAS

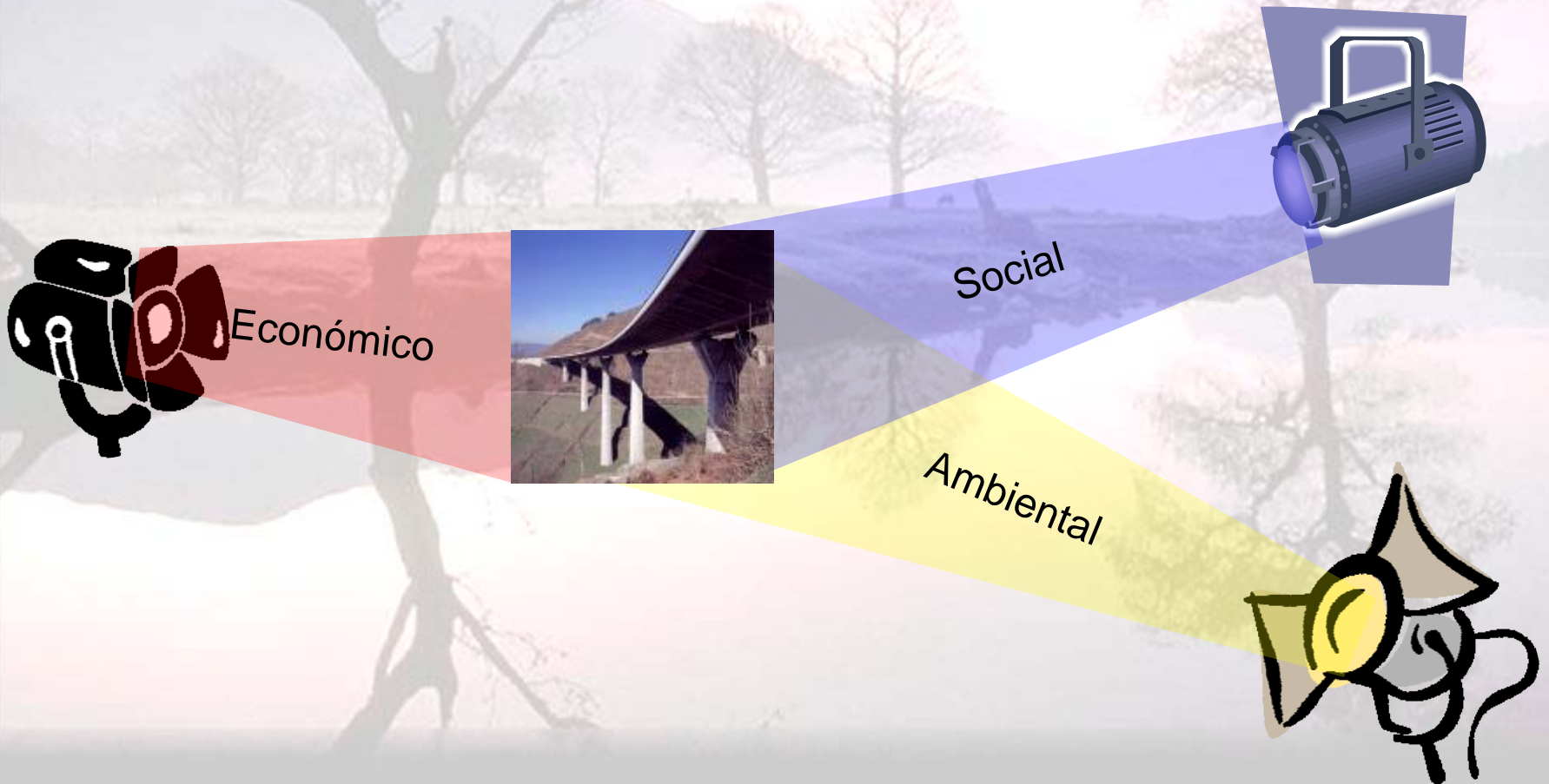
OBRAS FLUVIALES

PRESAS

METRO

Conclusión

Necesitamos sistematizar una visión integradora, uniforme y flexible



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