A pressure-state-response approach to cumulative impact assessment

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Contents

Issues

Impacts of mining are relatively well known

Issues

What about the impacts of several spatially concentrated projects?

The problem

- **Assessing cumulative impacts of a group of large mining and steelworks projects concentrated in a historical mining region**

Each project is submitted to an individual environmental assessment ....

but is it enough to assess the direct and indirect cumulative impacts?

and provide adequate mitigation?

The context

photo: L.E.Sánchez

MercoPress.
South Atlantic News Agency

Montevideo, March 14th 2015 - 20:59 UTC

CURRENT EDITION | TOPICS | REGIONS | NEWS ARCHIVE

Massive expansion of steel industry and iron mining in Brazil

Brazil's second largest steelmaker this week confirmed last September's pledge to invest 9 billion US dollars over the next four years, a dealing plans to plow 5.25 billion US dollars into mining, steel and cement projects in Minas Gerais state over the next six years.

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desenvolvimento.mg.gov.br | Buscar Informa | Institucional | Serviços | Programas e Ações | Investidor

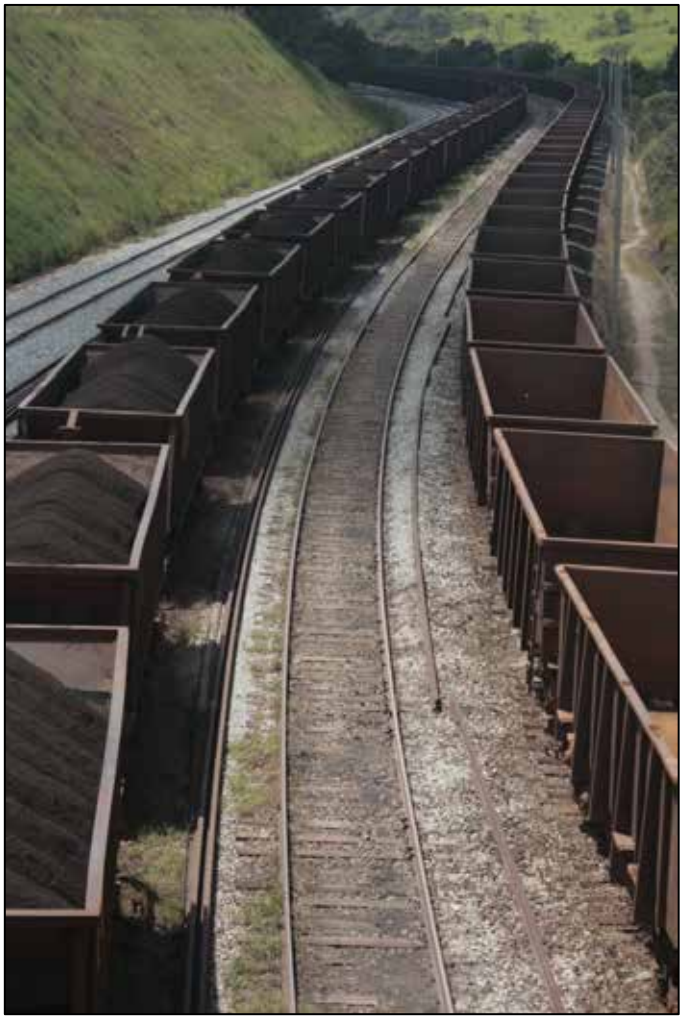
Início › Notícias › Aecio Neves confirms investiments of 9.5 billion Reais from CSN ›

Aecio Neves confirms investiments of 9.5 billion Reais from CSN

29 de Outubro de 2009, 13:12

Belo Horizonte (10/28/2009) – The National Steelworks Company (Companhia Siderúrgica Nacional) (CSN) confirmed this Wednesday (28) the execution of its expansion projects in Minas Gerais, among them the implementation of a steelwork plant in Congonhas, at the Campo das Vertentes region, that will add up to an investment of 9.5 billion Reais, Brazilian currency, which may reach 11 billion Reais by 2013. The investments will generate 13 thousand jobs in the state. The announcement was made to governor Aecio Neves by the CSN President, Benjamin Steinbruch, during a meeting at the Liberty Palace (Palácio da Liberdade), in Belo Horizonte.

Massive investments in Congonhas region

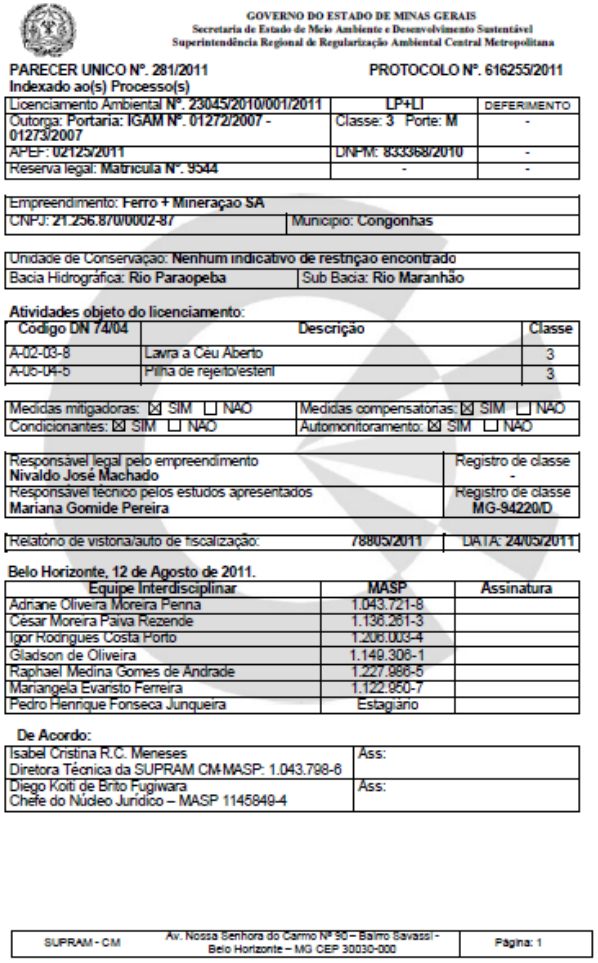


photos: L.E. Sánchez

The challenge

- **Assessing cumulative impacts using available information from government sources**

  - **EIS**
  - **EMPs**
  - **Monitoring and performance reports**
  - **Other official environmental information (e.g. authorizations for water abstraction)**



GOVERNO DO ESTADO DE MINAS GERAIS
Secretaria de Estado de Meio Ambiente e Desenvolvimento Sustentável
Superintendência Regional de Regularização Ambiental Central Metropolitana

PARECER UNICO Nº. 281/2011 PROTOCOLO Nº. 616255/2011
Indexado ao(s) Processo(s)

Licenciamento Ambiental Nº. 23045/2010/001/2011	LP+LI	DEFERIMENTO
Outorga: Portaria: IGAM Nº. 01272/2007 - 01273/2007	Classe: 3 Porte: M	-
APEF: 02125/2011	DNPM: 833968/2010	-
Reserva legal: Matrícula Nº. 9544	-	-

Empreendimento: Ferro + Mineração SA	
CNPJ: 21.256.870/0002-87	Município: Congonhas

Unidade de Conservação: Nenhum indicativo de restrição encontrado	
Bacia Hidrográfica: Rio Paraopeba	Sub Bacia: Rio Maranhão

Atividades objeto do licenciamento:

Código DN 74/04	Descrição	Classe
A-02-03-8	Lavra a Céu Aberto	3
A-05-04-5	Pilha de rejeito/estéril	3

Medidas mitigadoras: ☒ SIM ☐ NAO	Medidas compensatórias: ☒ SIM ☐ NAO
Condicionantes: ☒ SIM ☐ NAO	Automonitoramento: ☒ SIM ☐ NAO

Responsável legal pelo empreendimento Nivaldo José Machado	Registro de classe -
Responsável técnico pelos estudos apresentados Mariana Gomide Pereira	Registro de classe MG-94220/D

Relatório de vistoria/auto de fiscalização: 78805/2011	DATA: 24/05/2011

Belo Horizonte, 12 de Agosto de 2011.

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The challenge restated

- **There is a lot of data, information, documents, reports, analysis, assessments … on the projects, their impacts, the region …**

Is it possible to make better use of all this?

www.jie.itaipu.gov.br

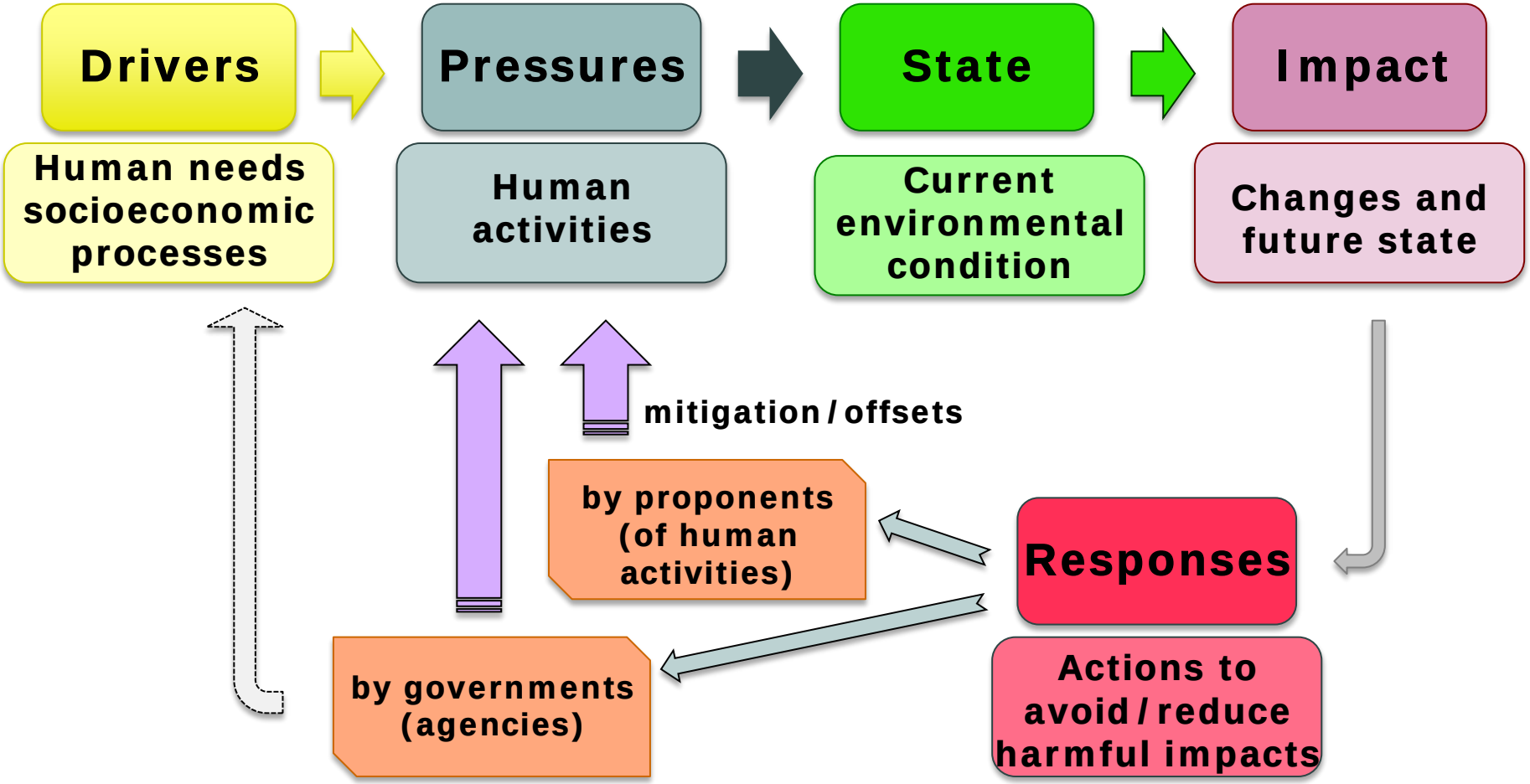
Methods

Guidance on CIA is available and evolving

How to adapt it to the "challenge" / research question ?

Methods: Pressure-State-Response

Driving forces-pressure-state-impacts-response



The expectations

- **To answer to simple questions such as:**

Pressure

- **Which amount of land is necessary for mining and industrial expansion?**
- **Which amount of natural/little modified habitats will be lost for M&I expansion?**
- **How much water is necessary for expansion?**

State - current and future

- **Is air quality close to saturation?**
- **Is there water available to meet future demand?**

Response

- **Which should be a biodiversity offsets strategy to cope with increased pressure?**

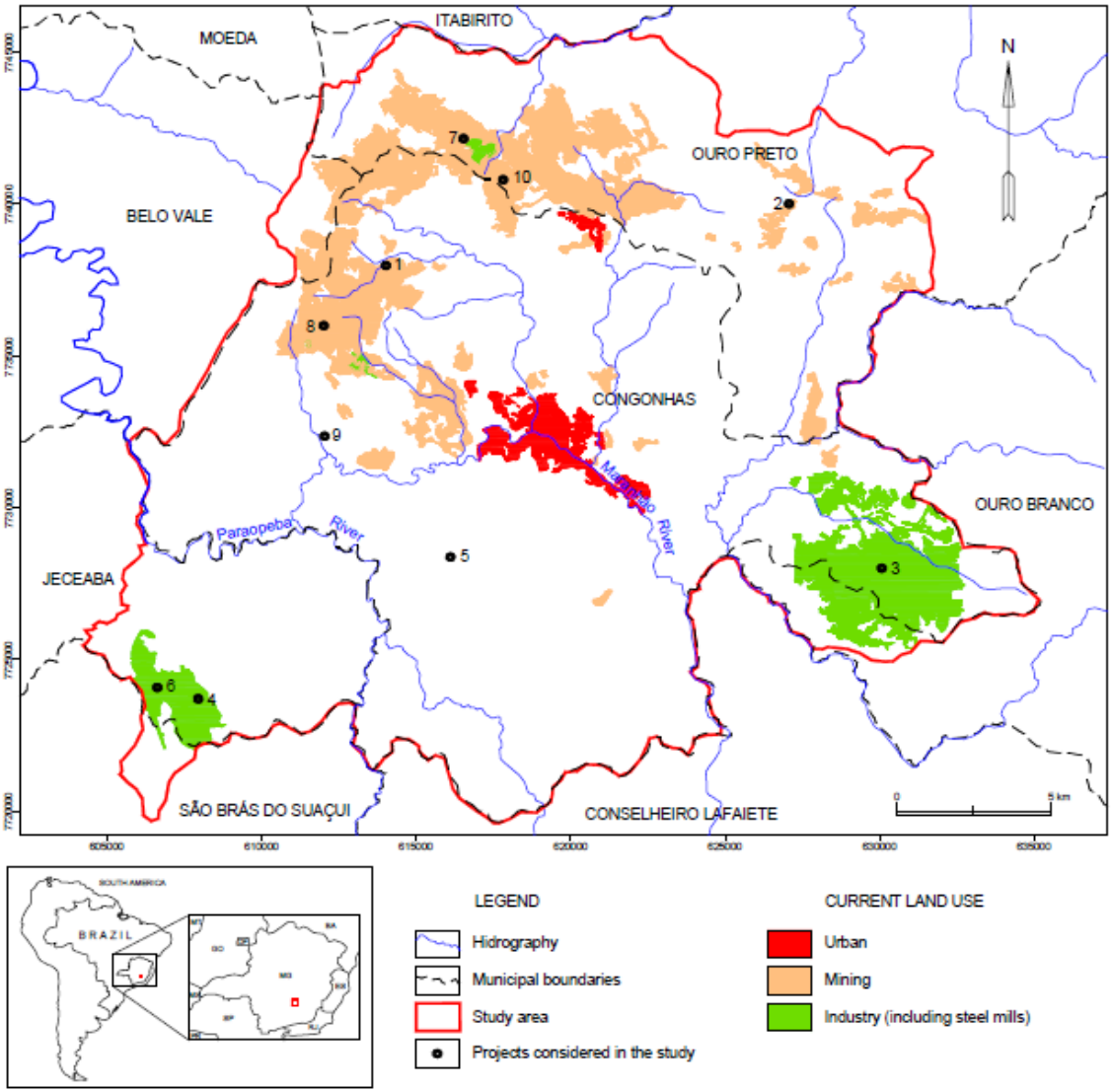
Methods: Research steps (1)

Step	Activity
Scoping	Selection of projects to be assessed
	Definition of temporal boundaries
	Selection of valued environmental and social components (VECs)
	Definition of the study area
	Selection of indicators
Data collection	Brief environmental and social description of the study area
	Description of recent land use history
	Compilation of key characteristics of selected projects and key environmental information

Methods: Research steps (2)

Step	Activity
Analysis	Compilation and review of pressure indicators
	Review of state indicators and outline of current environmental condition
	Review of response indicators
	Description of the likely future scenario
Synthesis and recommendations	Application of the PSR model to CIA: preparing a dashboard-style synthesis table
	Identification and analysis of key characteristics of current EIA process that hinder CIA
	Development of proposals to improve consideration of cumulative impacts under current EIA arrangements

Results: projects assessed

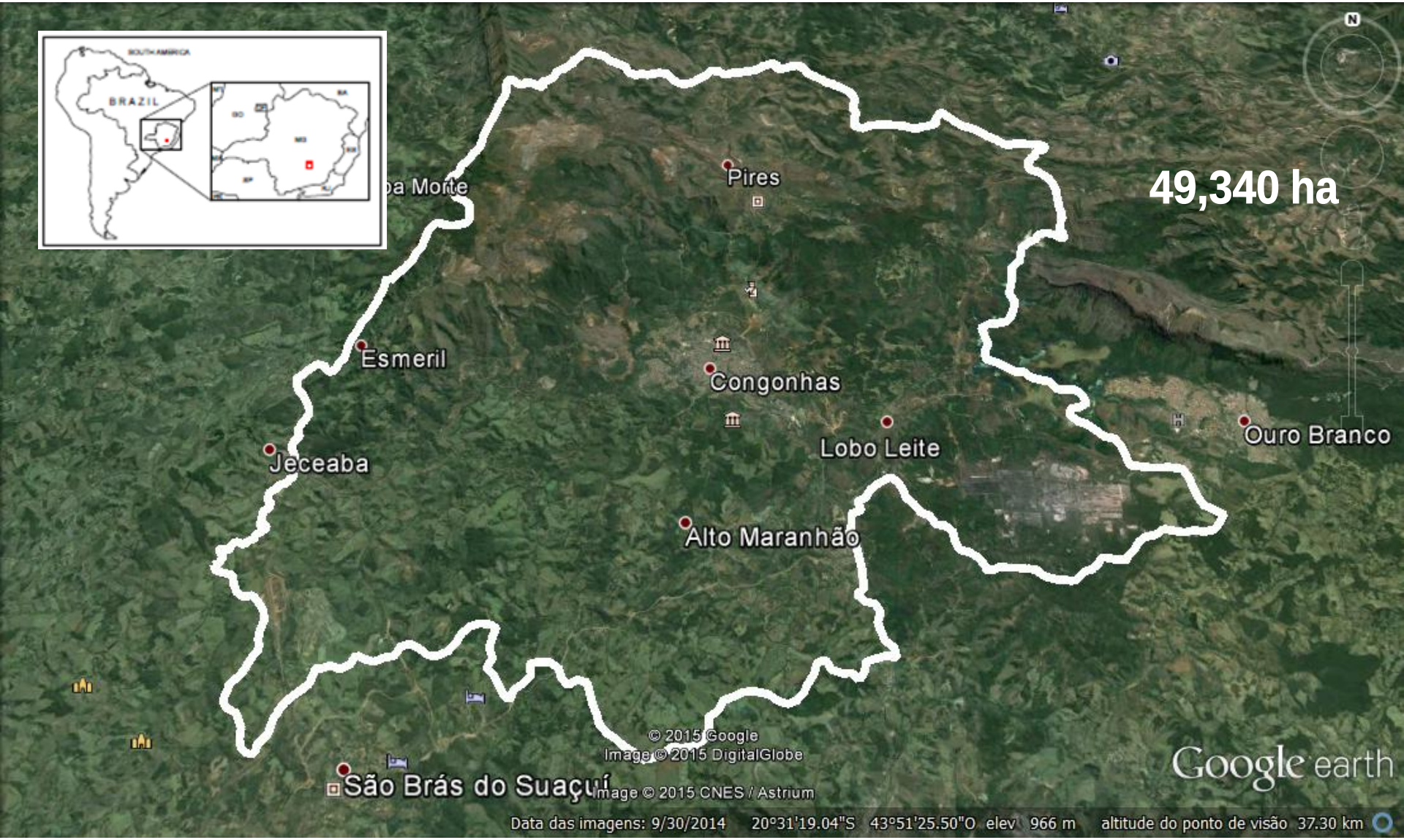


#	type	size
1	mine expansion	8.5 Mtpy
2	mine expansion	6 Mtpy
3	operating steel mill	3 Mtpy
4	new steel mill	0.6 Mtpy
5	industrial zone	n.a.
6	industrial zone	n.a.
7	mine expansion pellets plant	11.8 Mtpy 4.5 Mtpy
8	mine expansion	40 Mtpy
9	new mine	25 Mtpy
10	new mine	1 Mtpy

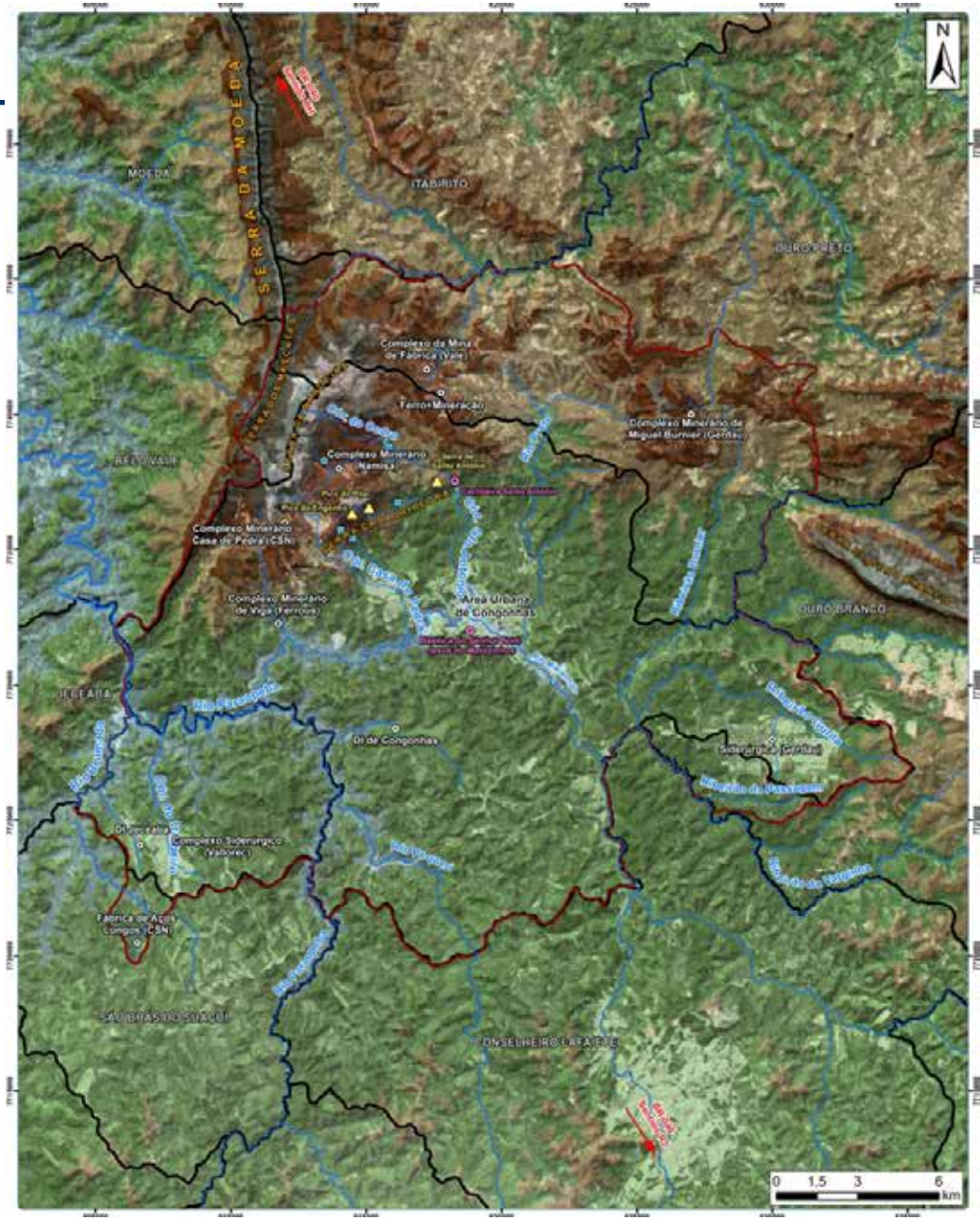
Results: Valued environmental and social components

VEC	reasons for inclusion
air quality	all projects are significant emitters of particulate matter other pollutants emitted in significant quantities by steel mills air pollution is an issue hotly debated in the local public arena
water resources	all mines operate or will build tailings dams most projects feature significant consumption of water in a region where supply is limited
natural vegetation	all projects require clear cut historical accumulation of vegetation loss most projects have a significant footprint and compete with other land uses
public roads	significant increase in road traffic in a number of projects, ore is hauled through public roads
natural and cultural heritage	World Heritage Site public concern about potential impacts of mining projects on the landscape

Results: study area



Results: study area



Results: pressure

Air: increase in future emissions of PM, PM_{10}, SO_2, CO, VOCs

estimated PM emissions from the projects = 3010 kg/h [2052 kg/h PM_{10}]

estimated PM emissions from transportation = 240 kg/h [181 kg/h PM_{10}]

Water: increased demand, quality impaired by sewage, urban runoff

combined demand from 10 projects ~ 7 m^3/sec

estimated demand for public supply ~ 0.1 m^3/sec

Natural vegetation: estimation of clear cut needs unavailable !

Road traffic: inconsistent information

Heritage: visual impact on mountains + archaeological sites

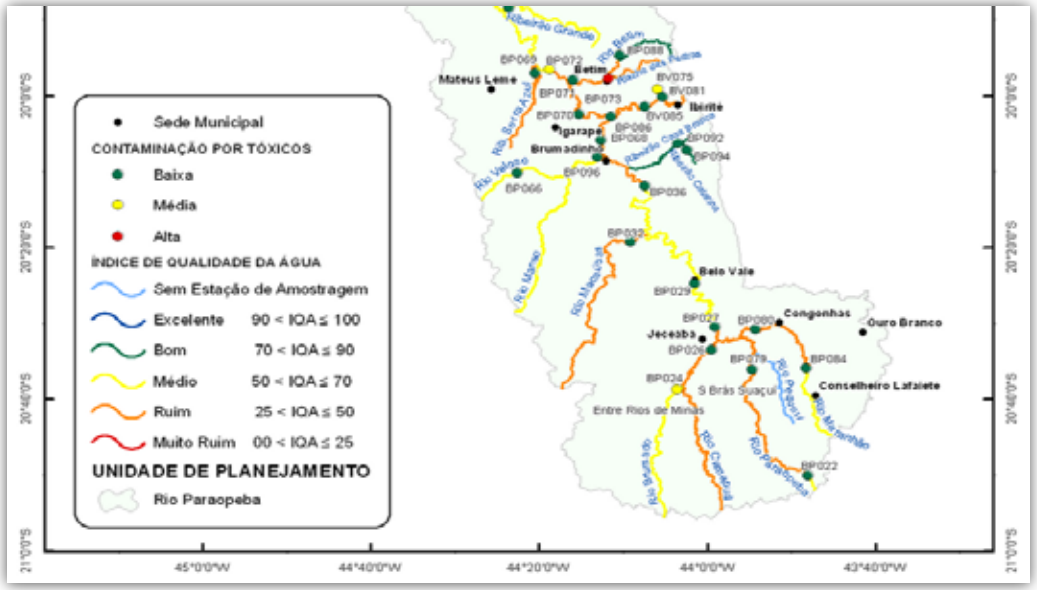
Current and future air pollutant emissions

Nº	Project	Baseline (kg/h)						Future emissions (kg/h)					
		PM	PM10	SO2	NOX	CO	VOC	PM	PM10	SO2	NOX	CO	VOC
1	Engenho Pires	143	92	1.6	8.8	11	1.4	342	267	436	920	698	73.6
2	Miguel Burnier	68	38	1.1	5.7	7.2	0.9	68	38	1.1	5.7	7.2	0.9
3	Açominas	615	438	1603	1240	10723	438	615	438	1603	1240	10723	438
4	Vallourec	0	0	0	0	0	0	85	85	315	224	59	6,8
5	Congonhas IZ	not available											
6	Jeceaba IZ	not available											
7	Fábrica	874	540	81	252	267	28	874	540	81	252	267	28
8	Casa de Pedra	703	458	25	122	156	17.6	703	458	25	122	156	18
9	Viga	76	54	6.3	31	39	4.5	163	113	6.3	31	39	4.5
10	Ferro+	30	24	4.8	24	29	3.5	163	113	6.3	31	39	4.5

Results: current state of the environment

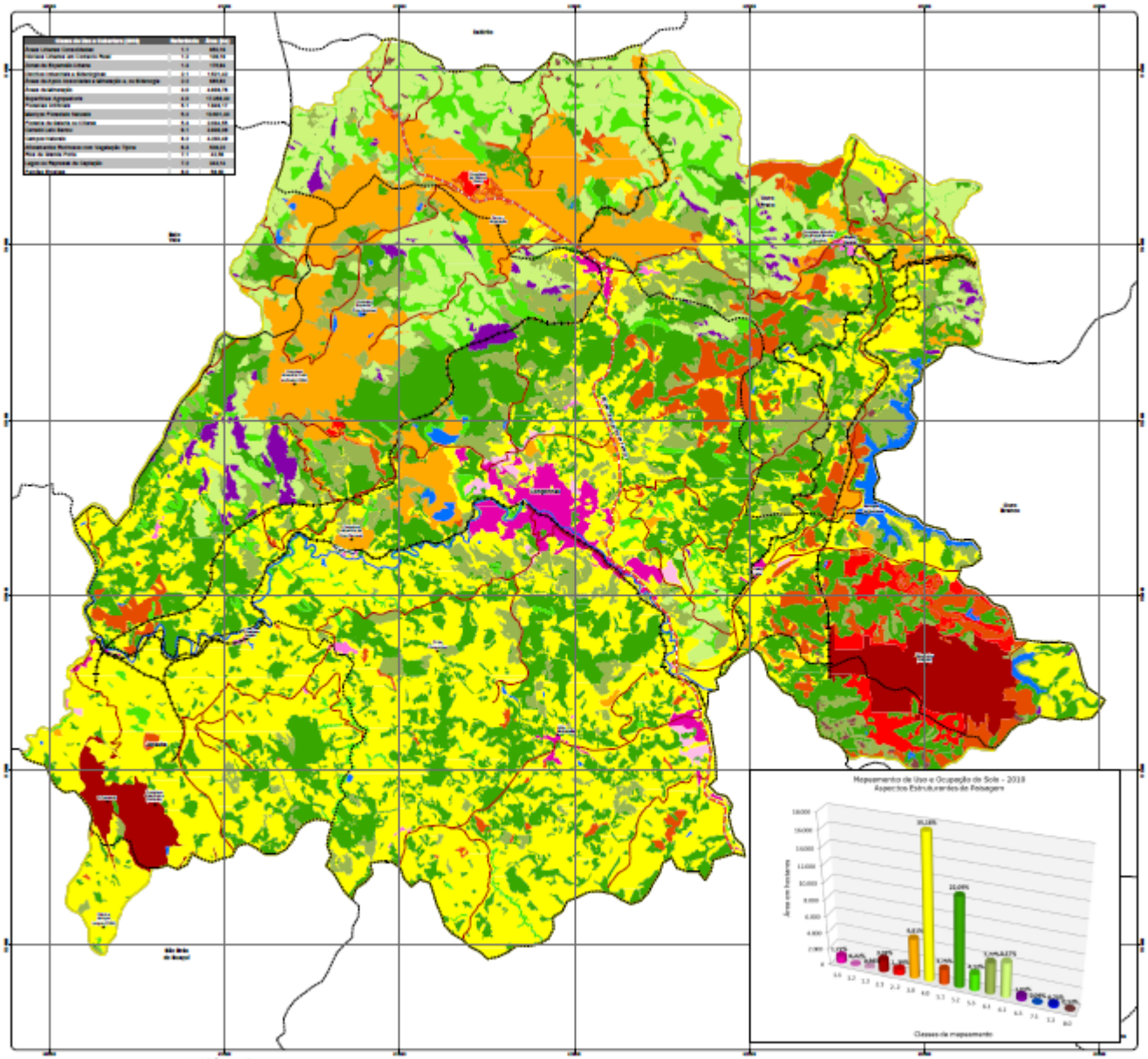
Air: national standards for PM-10 are met, but not WHO guidelines

Water quality: poor quality (water quality index)



Natural vegetation:
2,298 ha converted from natural cover to human use: 67.3% converted to mining use, the land use class that "consumed" more natural vegetation, seconded by agriculture (21.2%)

Land cover - 2010

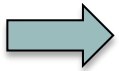


Land use classes

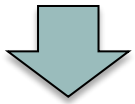
- urban
- industrial
- mining
- agriculture
- eucaplyptus
- forests
- savannah
- rock outcrop
  (with campos rupestres}
- water bodies
- eroded areas

Land cover change – 1989 x 2010

class	area (ha)		change
	1989	2010	
urban	855	1132	+ 32.5%
agriculture and cattle ranching	21,234	19,207	- 9.6%
mining + steel works	5,250	7,390	+ 40.8%
native grasslands	5,168	4,230	- 18.1%
savannah	4,304	3,836	- 10.9%
native forests	11,609	12,936	+ 11.4%
other	920	609	

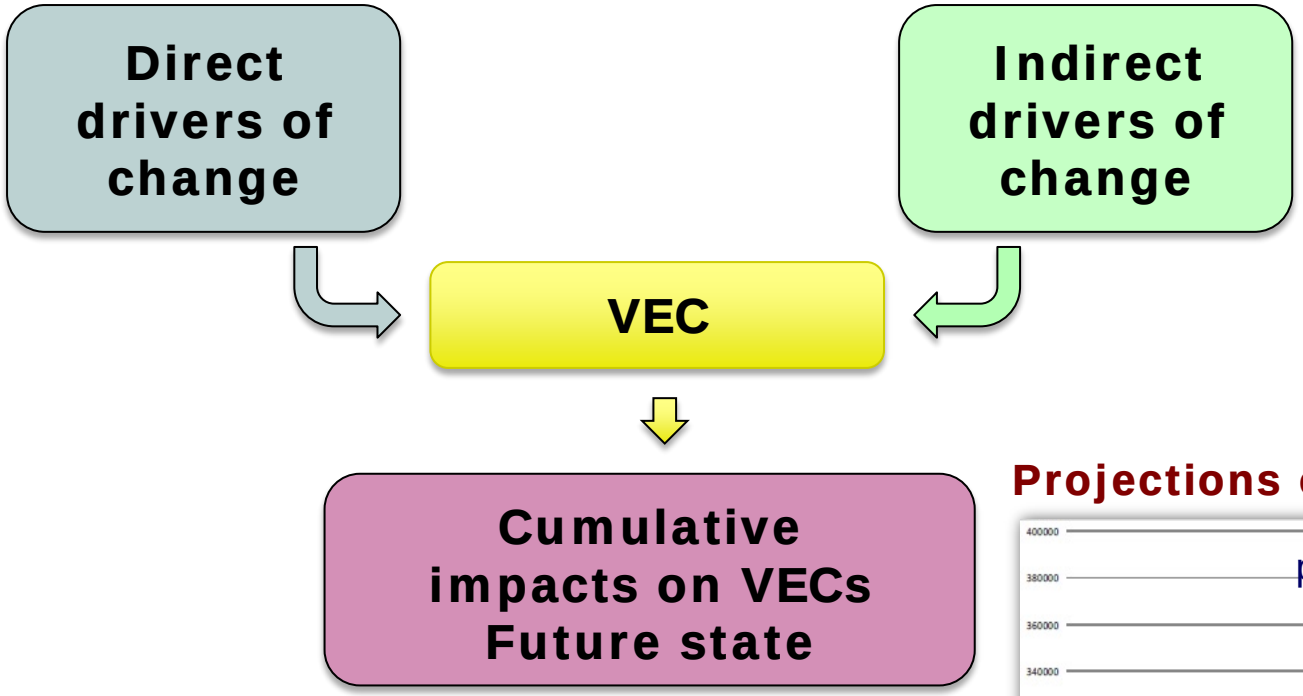


2,140 ha



1,549 ha converted from natural vegetation
[out of 2,298 ha of natural vegetation converted into other uses]

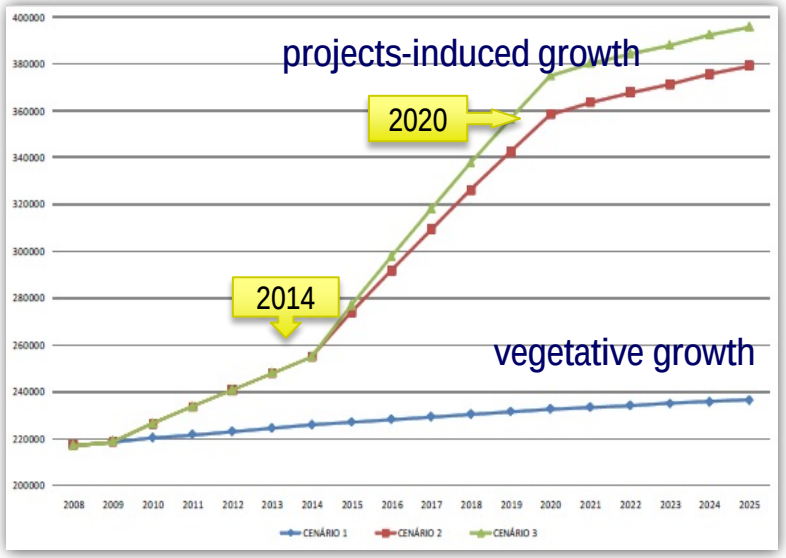
Results: future state of the environment



Direct drivers: the projects

Indirect drivers: population growth, land-use change, induced development

Projections of population growth

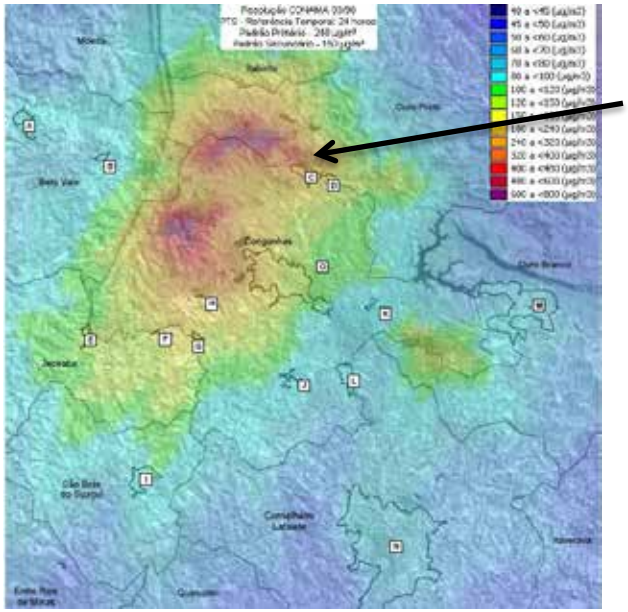


source: Cedeplar (2010)

Results: future state of the environment

Air: considering projects only, future concentrations are predicted to exceed WHO recommended targets (but to meet national standards)

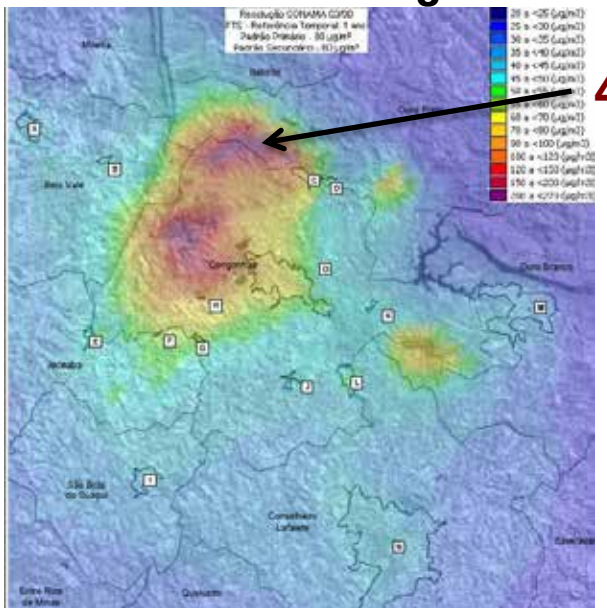
PM-10 max 24 h



129 µg / m³

source: Ecosoft (2012)

PM-10 average



41 µg / m³

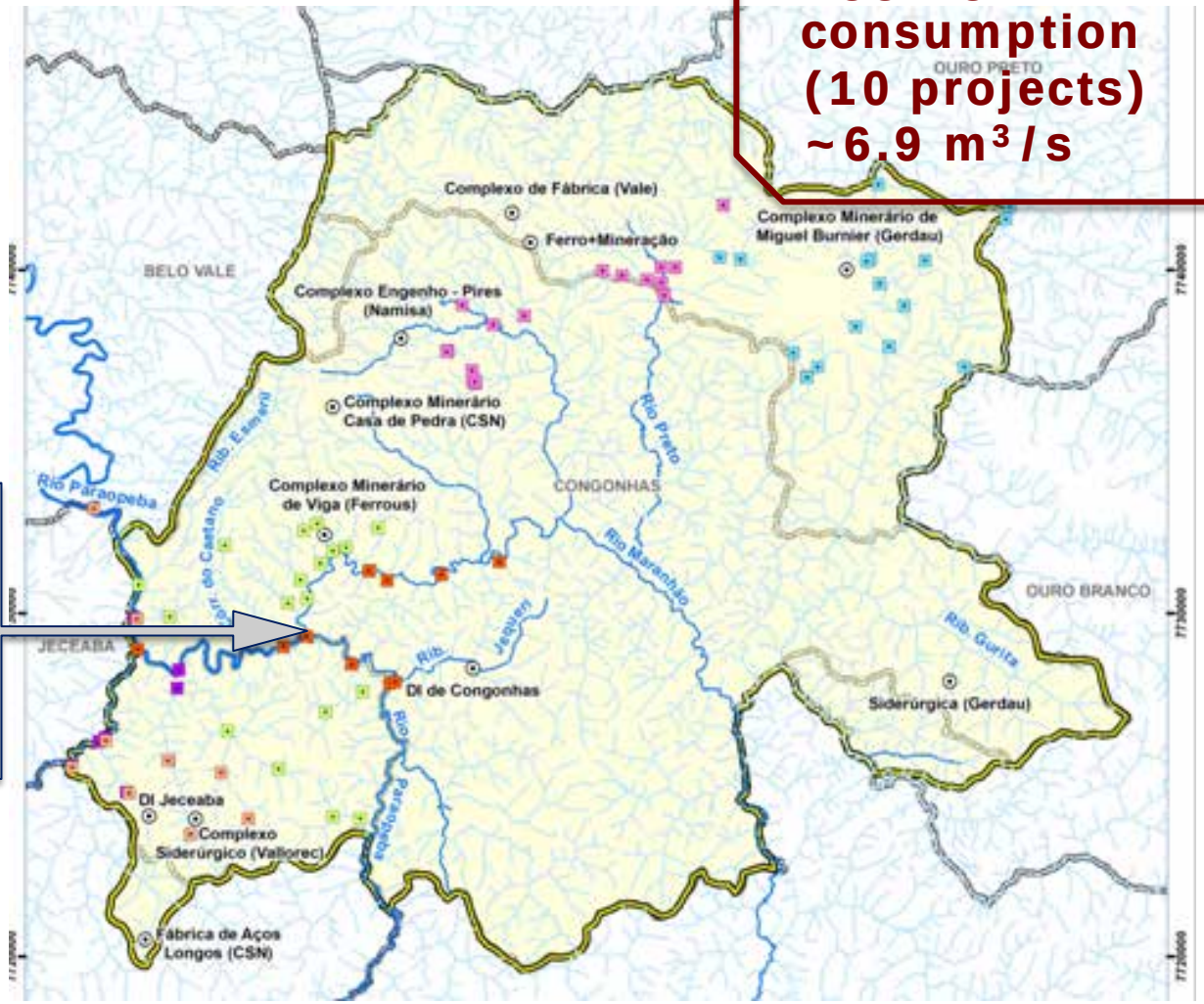
source: Ecosoft (2012)

PM-10 concentration	max 24 h	yr. avg.
WHO recommendation	50	20
WHO interim target 3	75	30

Results: future state of the environment

Water availability: highly impaired by the projects

Aggregate consumption (10 projects) ~6.9 m³/s



Long term average flow = 11.62 m³/s

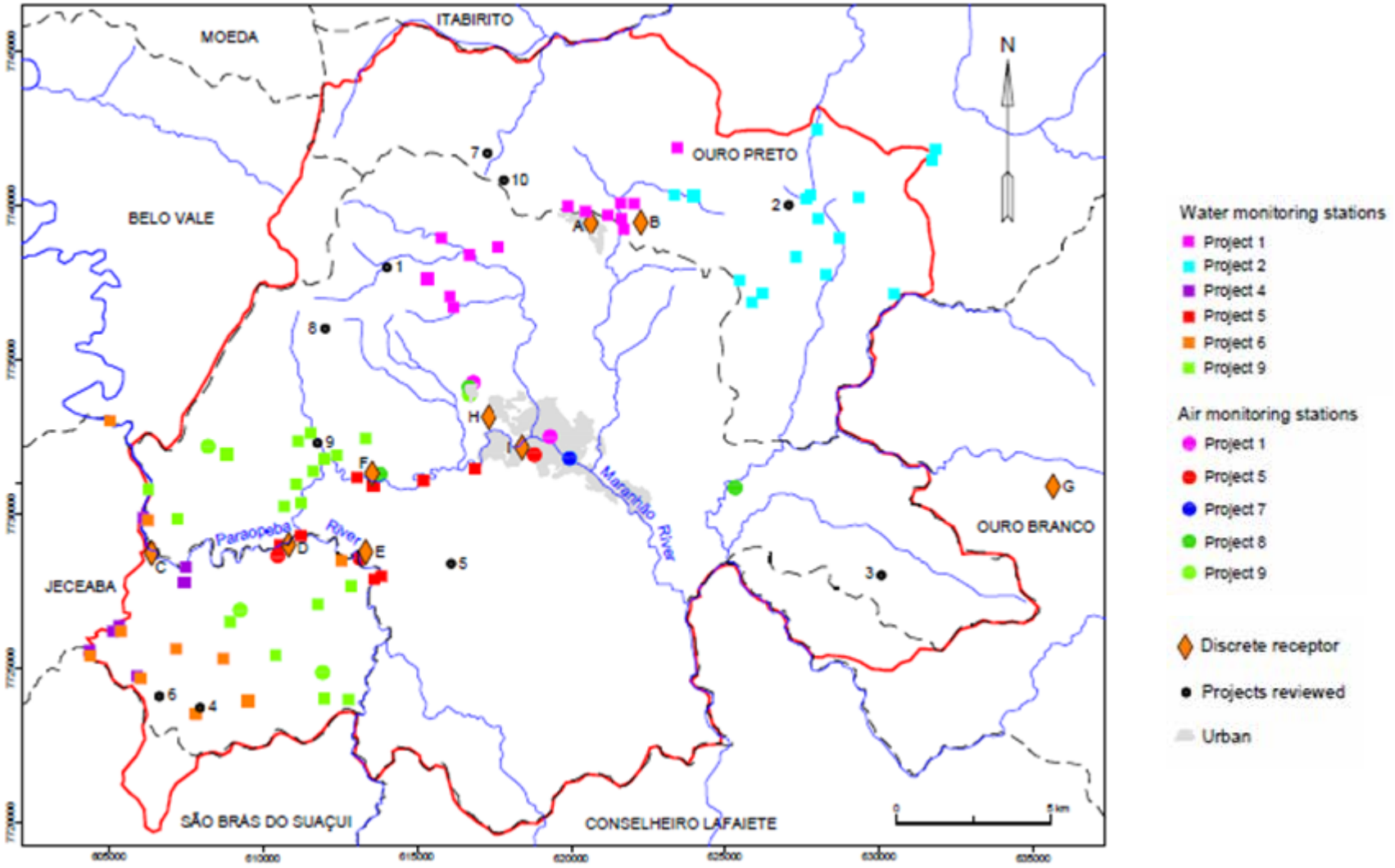
Minimum flow ($Q_{7,10}$) = 1.67 m³/s

Results: responses

What is being done		What should be done
mitigation	Defined on a project basis (or for each project component, e.g. a tailings dam)	Ø Review of all water abstraction authorizations
offsets		Ø Design and coordinated implementation of a biodiversity action plan
monitoring	Defined on a project basis (or for each project component)	Ø joint water and air monitoring at watershed / airshed scale

A collection of unconnected monitoring stations

Air and water monitoring stations



Findings (1)

- **About the EIA and licensing system**
  1. **Projects assessed on an individual basis without any consideration of cumulative impacts**
  2. **Combined effects of assessed projects …**
  3. **Data collected in the follow-up phase - important for depicting the current state of the environment - is not standardized and of very limited utility beyond checking compliance by individual companies**
- **About cumulative impacts in the study area**
  4. **the future state will likely be critical for both air and water quality**
  5. **the combined result of rehabilitation and offsets will likely lead to a stable state for natural vegetation cover**

Findings (2)

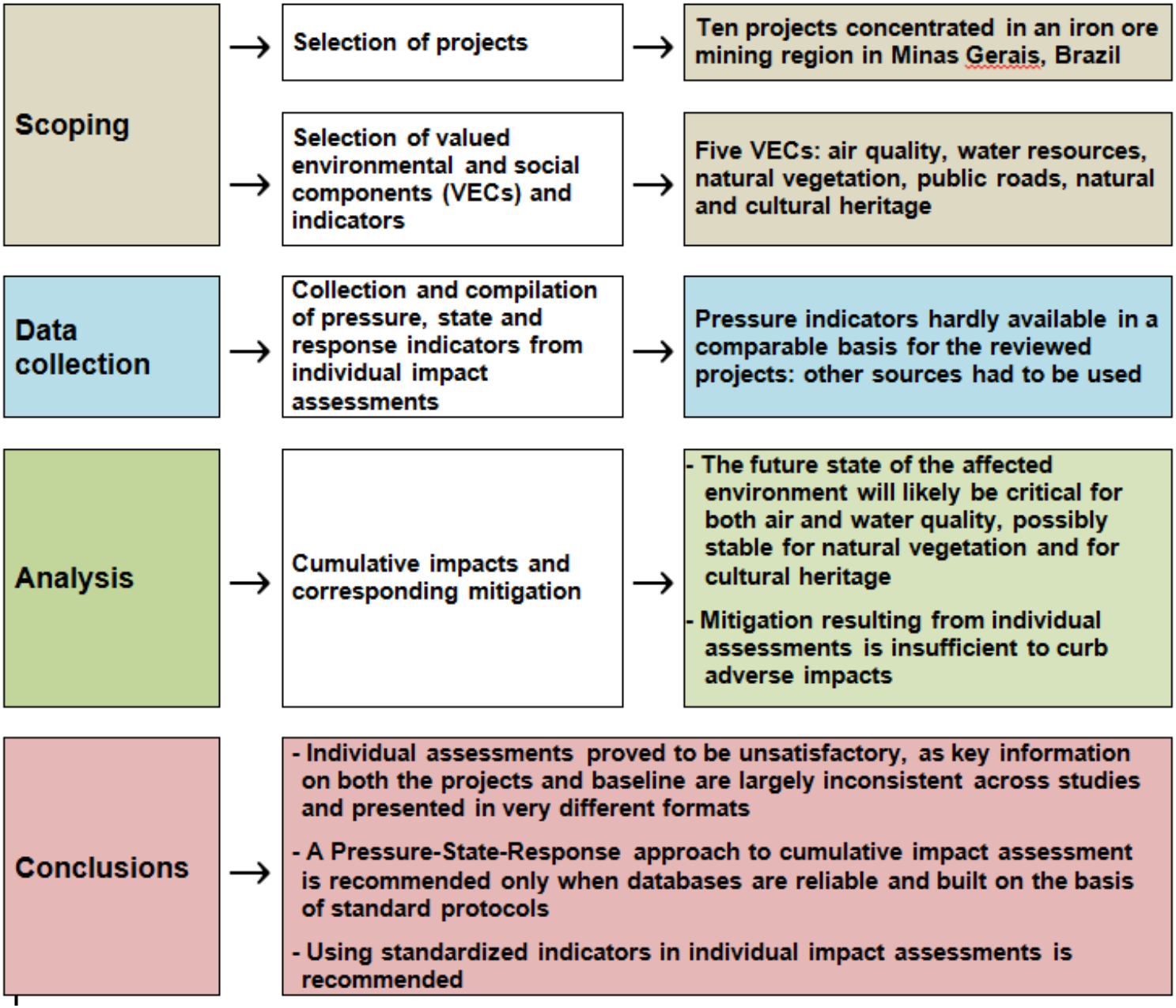
VEC	Current State	Trend	Likely Future State	Comments
Air quality	↔	↘	●	Increase in fugitive emmisions, exceedence of air quality standards
Water resources	↔	↘	●	Population and urban expansion leads to increase in sewage and non point pollution Increased demand from projects
Natural vegetation	↔	→	↔	Loss of forest fragments, covenants and mandatory restoration may offset losses
Public roads	↔	→	↔	Traffic increase due to projects may be balanced by new investments in highways
Heritage	Δ	↘	↔	Landscape changes, loss of caves, investment in conservation and restoration

Legend (state): Δ good ↔regular ● bad

Conclusions (of broader interest)

- **the PSR approach to CIA is information-intense and recommended only when databases are reliable**
- **consistent use of standardized indicators in individual impact assessments would facilitate CIA**
- **key role to be played by the government in establishing publicly accessible databases built upon standard protocols for data and information provision**

In summary


Scoping
Selection of projects
Ten projects concentrated in an iron ore mining region in Minas Gerais, Brazil
Selection of valued environmental and social components (VECs) and indicators
Five VECs: air quality, water resources, natural vegetation, public roads, natural and cultural heritage
Data collection
Collection and compilation of pressure, state and response indicators from individual impact assessments
Pressure indicators hardly available in a comparable basis for the reviewed projects: other sources had to be used
Analysis
Cumulative impacts and corresponding mitigation
- The future state of the affected environment will likely be critical for both air and water quality, possibly stable for natural vegetation and for cultural heritage
- Mitigation resulting from individual assessments is insufficient to curb adverse impacts
Conclusions
- Individual assessments proved to be unsatisfactory, as key information on both the projects and baseline are largely inconsistent across studies and presented in very different formats
- A Pressure-State-Response approach to cumulative impact assessment is recommended only when databases are reliable and built on the basis of standard protocols
- Using standardized indicators in individual impact assessments is recommended

Acknowledgements

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