Assessing the Economic Impacts of Transportation Infrastructure Policies in Brazil

Eduardo Haddad Fernando Perobelli Edson Domingues Maurício Aguiar

Outline

- ✓ Motivation
- Overview of the B-MARIA-MG model
- Modeling of transportation costs
- Transportation infrastructure projects

Transportation costs may be seen as one of the main obstacles to growth in Brazil…

Brazilian transport infrastructure is deteriorating fast from lack of investment and maintenance, showing an increased number of critical points, or bottlenecks, in most of the corridors.

Decay in the transportation system curtails economic growth, hampering competitiveness both in the internal and external markets.

Deterioration of Brazil's transportation network in the last years contributed to high operational costs, obstructing the competitive integration of the country.

... hampering competitiveness both in the internal and external markets

Estimated Soybean Export Costs
(US$/metric ton; 1st quarter 2006)

To Germany (Hamburg)	*Brazil (Mato Grosso)*	*U.S. (Iowa)*	*Brazil/US cost ratio*
Production cost	157.86	204.78	0.77
Transport cost to export port	84.65	30.84	2.74
Freight cost to Hamburg	38.51	19.53	1.97
Final cost in Hamburg	281.02	255.15	1.10

To China (Shanghai)	*Brazil (Goias)*	*U.S. (Minneapolis)*	*Brazil/US cost ratio*
Production cost	180.71	202.34	0.89
Transport cost to export port	42.49	34.80	1.22
Freight cost to Shanghai	50.13	35.71	1.40
Final cost in Shanghai	273.33	272.85	1.002

Source: U.S. Department of Agriculture, Brazil Soybean Transportation, Aug. 2006 (*apud World Bank, 2006)*

There are government initiatives in Brazil to promote investments in infrastructure…

Programa de Aceleração do Crescimento (PAC), unveiled at the end of January 2007

- Investments in logistic infrastructure are estimated in USD 58.3 billions in the four-year period 2007-2010, USD 33.4 billions (57.3% of the total) only in road infrastructure

Projeto Piloto de Investimento (PPI)

- Allows the government to reduce the primary surplus by an equivalent amount to an increase in infrastructure expenditure

Plano Nacional de Logística e Transportes (PNLT)

- Federal government has also signaled its intention in reviving long term planning in transportation in the country

At the state level, few initiatives have taken place in the realm of transport planning ("*Pelts*")

... whose *ex ante* impacts need to be properly assessed

There is a growing need for economic and socio-economic models for helping improving road management (World Road Association, 2003, p. 7)

In a context where the public administrations experience a stronger and stronger demand on social policy, and where road budgets tend to be tightened or even scaled back, the economic evaluation – and optimization – of road investment actions and/or policy becomes a recurrent requirement

This study provides an attempt to meet this requirement

Outline

Motivation

✓ Overview of the B-MARIA-MG model

Modeling of transportation costs

Transportation infrastructure projects

The B-MARIA-MG model has been developed for assessing regional impacts of transportation policies

Starting point: B-MARIA (Haddad, 1999) and its extensions

- Well documented
- Critical reviews
- Various applications

Need to undertake structural modifications to achieve the goal of this paper

- Haddad and Hewings (QREF, 2005)

Mainly developed for the *Pelt Minas*

General features of the model

Interstate bottom-up CGE model for Brazil, with **focus on Minas Gerais**

- 109 regions (75 within MG)
- 8 sectors/goods

Interregional flows of goods and services

Interregional factor mobility

Explicit modeling of transportation costs based on origin-destination pairs

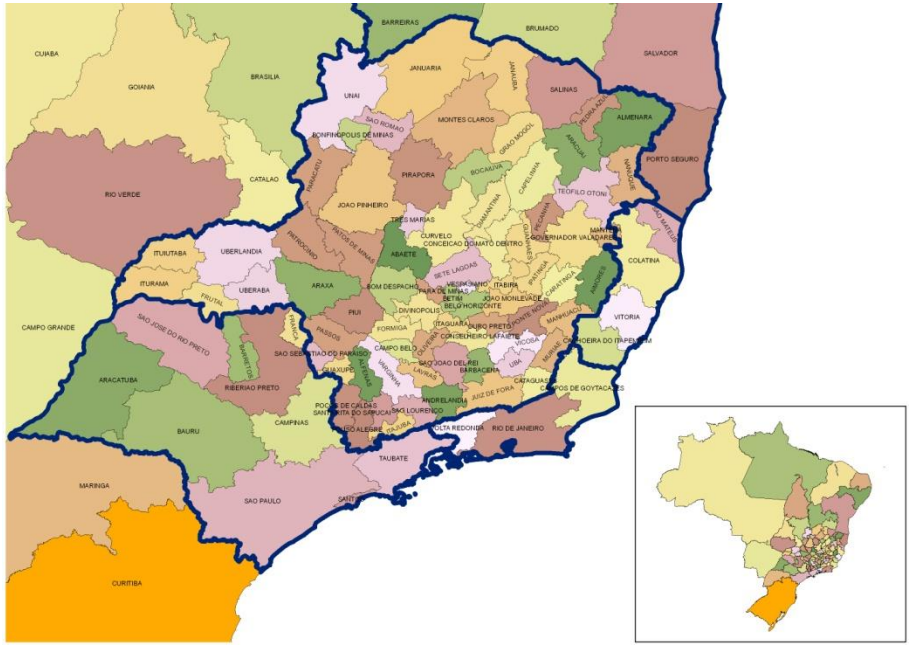
Integrated with a geo-coded transportation model (**HDM-4**)

Regional and Federal government

Regional labor markets

Non-constant returns to scale (agglomeration economies)

Regional and sectoral settings in B-MARIA-MG



Regional setting

1	Agriculture
2	Mining
3	Manufacturing
4	Construction
5	Transportation
6	Trade
7	Public administration
8	Other services

Sectoral aggregation

Outline

Motivation

Overview of the B-MARIA-MG model

✓ Modeling of transportation costs

Transportation infrastructure projects

Transportation services use scarce resources from the economy

In B-MARIA-MG, transportation services are produced by a regional resource-demanding optimizing transportation sector

A fully specified production possibility frontier (PPF) has to be introduced for the transportation sector, which produces goods consumed directly by users and consumed to facilitate trade, i.e. transportation services are used to ship commodities from the point of production to the point of consumption

The model is calibrated by taking into account the specific transportation structure cost of each commodity flow, providing spatial price differentiation, which indirectly addresses the issue related to regional transportation infrastructure efficiency

Space plays a major role

Regional production technology in B-MARIA-MG: highlighting the transportation sector

Innovation: modeling integration to HDM-4

Prices paid for commodity *i* from region *s* in region *q* by each user equate to the sum of its basic value and the costs of the relevant taxes and margin-commodities

The role of margin-commodities is to facilitate flows of commodities from points of production or points of entry to either domestic users or ports of exit

Margin-commodities, or, simply, margins, include transportation and trade services, which take account of transfer costs in a broad sense

The margin demand equations show that the demands for margins are proportional to the commodity flows with which the margins are associated; moreover, a technical change component is also included in the specification in order to allow for changes in the implicit transportation rate

In the case of imported goods, the implicit transportation margin refers to the costs at the port of entry, while for exports it refers to costs at the port of exit

Demand for transport services

The general functional form used for the equations of margin demand, for different users, is presented below

$$XMARG(i,s,q,r) = AMARG(i,s,q,r) * [\eta(i,s,q,r) * X(i,s,q)^{\theta(i,s,q,r)}] \quad (1)$$

where *XMARG(i,s,q,r)* is the margin *r* on the flow of commodity *i*, produced in region *s* and consumed in region *q*; *AMARG(i,s,q,r)* is a technology variable related to commodity-specific origin-destination flows; $\eta(i,s,q,r)$ is the margin rate on specific basic flows; *X(i,s,q)* is the flow of commodity *i*, produced in region *s* and consumed in region *q*; and $\theta(i,s,q,r)$ is a parameter reflecting scale economies to (bulk) transportation

Linkage variables

The explicit modeling of transportation costs, based on origin-destination flows, which takes into account the spatial structure of the Brazilian economy, creates the capability of integrating the interstate CGE model with a geo-coded transportation network model, enhancing the potential of the framework in understanding the role of infrastructure on regional development

Two options for integration are available, using the linearized version of the model, in which equation (1) becomes:

$$xmarg(i,s,q,r) = amarg(i,s,q,r) + \theta(i,s,q,r) * x(i,s,q)$$

Considering a fully specified geo-coded transportation network, one can simulate changes in the system, which might affect relative accessibility (e.g. road improvements, investments in new highways).

A matrix of interregional transport cost can be calculated *ex ante* and *ex post*, and mapped to the interregional CGE model. This mapping includes two stages, one associated with the calibration phase, and another with the simulation.

Matrix of interregional transport costs estimated…

Data on the Brazilian network were obtained from the database developed for the PELT Minas (Fipe, 2007)

This data set, in the form used in this research, includes not only the highway network, but also railroad network and other modes of lesser importance for Minas Gerais, enabling the examination of **multimodal alternatives**

All data manipulation and network calculations were carried out using the general and the transport planning modules of the TransCAD software (Caliper, 2000)

Motorized vehicle speeds and operating resources are determined as functions of the characteristics of each type of vehicle and the geometry, surface type and current condition of the road, under both free flow and congested traffic conditions.

... under a multimodal perspective (HDM-4)

Railroad costs used in this study are based on actual freight values charged by operators

Thus, transport costs for each origin-destination pair were initially calculated by specific transport mode, in BRL/ton.

Following that, these costs were weighted by the tonnage use in each transport mode, providing the necessary information for calibration of the model

Calibration procedure takes into account...

The process of calibration of the B-MARIA-MG model requires information on the transport margins related to each commodity flow

Aggregated information for margins on intersectoral transactions, capital creation, household consumption, and exports are available at the national level

The problem remains to disaggregate this information considering previous spatial disaggregation of commodity flows in the generation of the interregional input-output accounts, and the further available information – transport model, matrix of weighted multimodal transport costs, and national aggregates for specific margins

... key elements of the Brazilian interregioal economic system

In summary, the calibration strategy adopted here takes into account explicitly, for each origin-destination pair, key elements of the Brazilian integrated interregional economic system, namely:

a) the type of trade involved (margins vary according to specific commodity flows);

b) the multimodal transportation network; and

c) scale effects in transportation, in the form of long-haul economies.

Simulation strategy

Changes in the matrix of interregional transport costs are calculated in the transport model, so that an interface with the interregional CGE model is created

In the B-MARIA model, information on transport rates is available, and so is information on the relevant network links, enabling estimation of a model-consistent transportation cost function. With that in hand, changes in transport rates can be estimated and incorporated in the interregional CGE model, as follows. Rearranging equation (1), we have:

$$\frac{XMARG(i,s,q,r)}{X(i,s,q)^{\theta(i,s,q,r)}} = AMARG(i,s,q,r) * \eta(i,s,q,r)$$

With θ equal to one implying that the left-hand-side is equivalent to the specific margin rate. A percentage change in the margin rate can then be mapped into the technology variable. Thus, in percentage-change form, amarg(i,s,q,r) becomes the relevant linkage variables!

Outline

Motivation

Overview of the B-MARIA-MG model

Modeling of transportation costs

✓ Transportation infrastructure projects

We illustrate the analytical capability of the unified framework...

The case study under consideration refers to two projects of improvement of federal highways – BR-262 and BR-381 – in the State of Minas Gerais

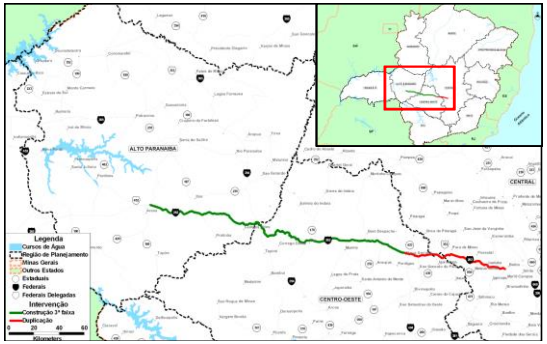
The following analysis suggests a strategy of application of the framework developed here for the evaluation of a project in a systemic context, in its **operational phase**

The impacts of the investment phase are not considered in these illustrative exercises

The guidelines that have been used to justify the choice of these specific tracks of the BR-262 and BR-381 highways to be improved are based upon the grounds of the **strategic location of this network links in the national transportation system**, which constitute two of the main corridors related to the more dynamic regions of the country.

... in the evaluation of specific transportation projects contemplated in the PAC program

BR-262



✓ Total length: 441 km

✓ Total costs: BRL 554 millions

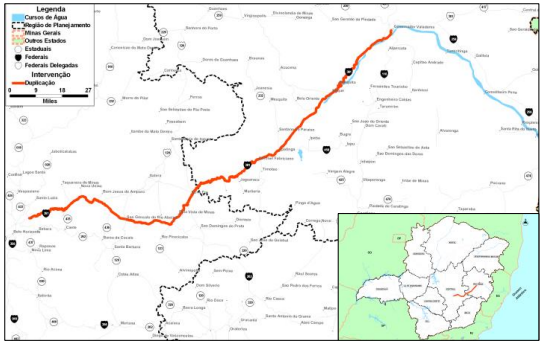
✓ Duplication of the existing road link between Betim and Nova Serrana, and the construction of climbing and passing lanes between Nova Serrana and Araxá

✓ The BR-262 project constitutes a major improvement on the **east-west integration of the country**, linking the coast of the Southeast to the more agricultural areas of the Midwest

✓ Spatial competition occurs in a lower degree

✓ More specialized spaces

BR-381



✓ Total length: 304 km

✓ Total costs: BRL 1,395 millions

✓ Duplication of the track between Belo Horizonte and Governador Valadares

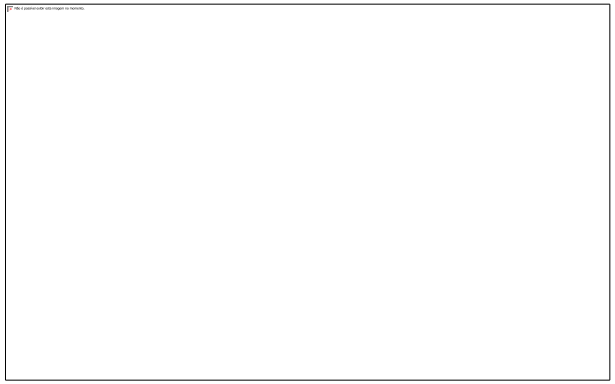
✓ The BR-381 project has a strategic role in the **integration of the Northeast with the Southeast and South** of the country

✓ Spatial competition occurs in a higher degree

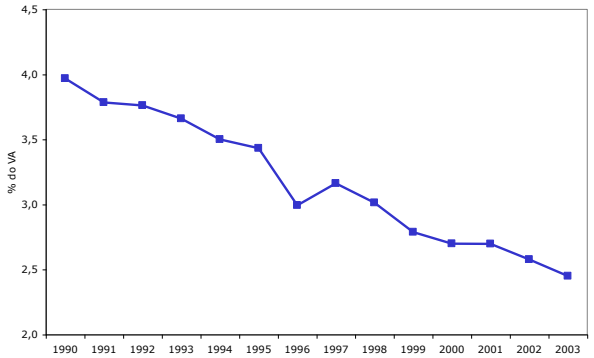
✓ Denser economic spaces are directly involved in the spatial process

Functioning mechanisms of the simulations

Recent evolution of transport sector



Share of transport sector in VA



Aggregate results

	BR-262		*BR-381*	
	SR	*LR*	*SR*	*LR*
Aggregates				
Real GDP	0,00022	0,00105	0,00018	(0,00293)
Aggregate employment, wage bill weights	(0,00131)	(0,00030)	(0,00670)	(0,00481)
Equivalent variation – total (change in $ 1,000,000)	(12,3)	58,6	(48,3)	6,4
Economy-wide terms of trade	(0,00180)	0,00040	(0,00674)	0,00299
GDP price index, expenditure side	(0,00240)	(0,01598)	(0,00818)	0,00242
GDP components				
Real household consumption	(0,00047)	0,00139	(0,00132)	(0,00344)
Real aggregate investment	-	0,00001	-	(0,00002)
Real aggregate regional government demand	(0,00217)	0,00129	(0,01301)	(0,00156)
Real aggregate federal government demand	(0,00047)	0,00139	(0,00132)	(0,00344)
International export volume	0,00385	(0,00017)	0,01456	(0,00683)
International import volume	(0,00239)	0,00019	(0,00823)	(0,00397)

What do the aggregate results tell us? – BR-262

Gains in efficiency (real GDP growth) are positive in both the short run and the long run, while welfare gains (equivalent variation) are revealed only in the long run.

Noteworthy is that in the long run the effects on GDP are magnified.

In terms of employment, in the short run we verify negative results (reduction in employment), led by the weak performance of the transportation and construction sectors; the latter, specifically, has a strong employment coefficient.

In the long run this negative employment performance still prevails, but to a lesser degree, as activity effects partially overcome the sectoral structural effects.

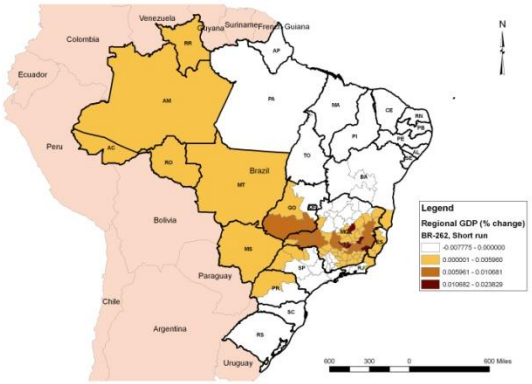
GDP components – BR-262

Changes in terms of trade tend to benefit Brazilian exports only in the **short run**, as the results point to increasing competitiveness of Brazilian products. This conclusion is reinforced by the performance of the international trade sector: exports volumes increase, leading GDP growth in the short run. When compared to other GDP components, international trade is the only component that presents a positive performance in the short run.

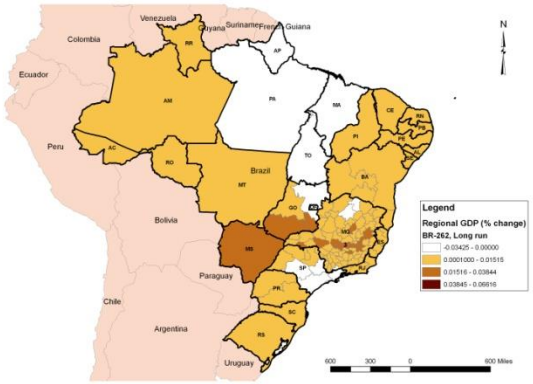
In the **long run**, though, this situation is reversed: while stronger penetration of imported products is verified, due to the reversal of the terms of trade result, domestic absorption becomes the component in chief, leading GDP growth.

Spatial GDP effects – BR-262

Short run



Long run



The spatial effects on GDP reveal, both in the short run and in the long run, positive impacts in regions directed influenced by the BR-262. Noteworthy is that these positive impacts spread over space in the long run. Moreover, re-location effects tend to be directed to the agriculture-producing regions in the West as well as to the areas directly linked to the project itself within the borders of Minas Gerais.

What do the aggregate results tell us? – BR-381

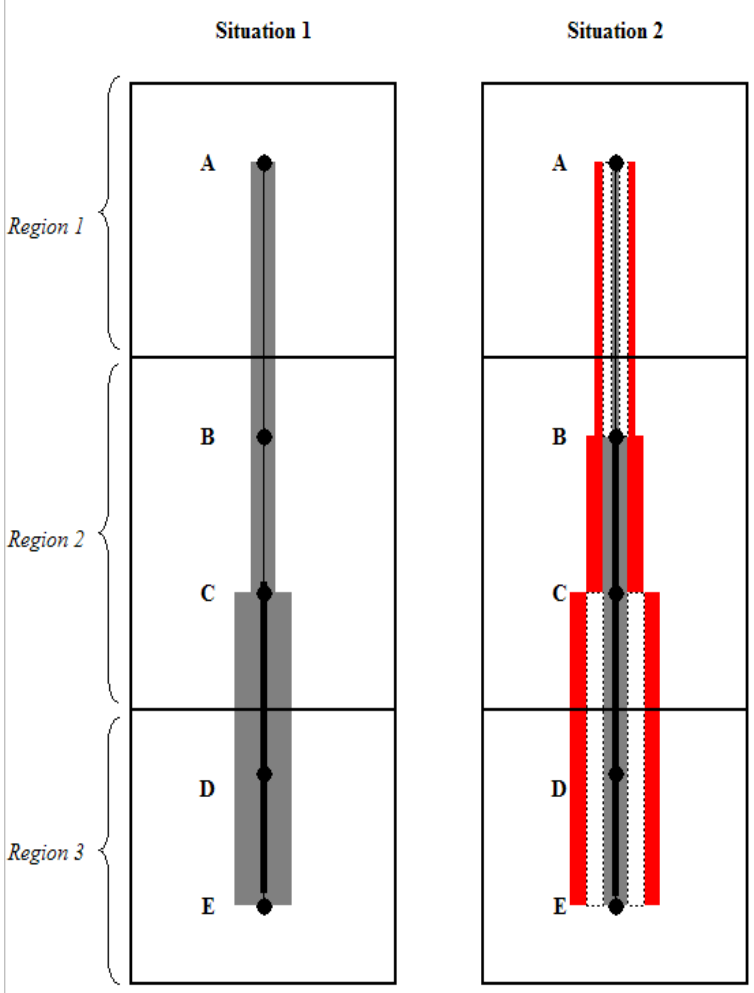
Macroeconomic short run results are qualitatively equivalent to those presented by the BR-262 project: GDP growth led by the international sector and improvement in the terms of trade, as well as increasing overall competitiveness.

Real GDP in the long run is projected to decrease, after the duplication project starts to operate.

Lower growth with decreasing reginal inequality.

- Localized spillover models (Baldwin *et al*., 2003)

Schematic interpretation of the simulation of the BR-381 project



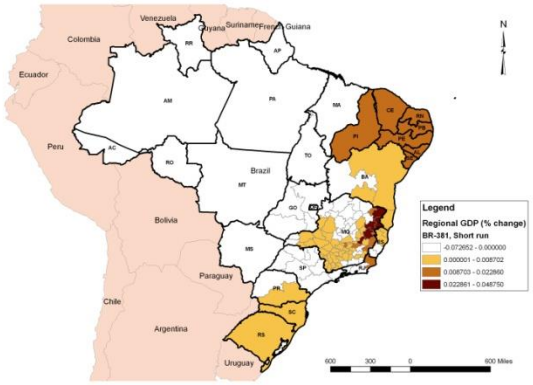
	Link capacity		Economic density	Cost change
	Situation 1	*Situation 2*		
A-B	Limit	Over capacity	Low	Positive
B-C	Limit	Under capacity	Low	Negative
C-D	Limit	Over capacity	High	Positive
D-E	Limit	Over capacity	High	Positive
Network effects				
A-C	-	-	-	Negative
A-D	-	-	-	Negative
A-E	-	-	-	Negative
B-D	-	-	-	Negative
B-E	-	-	-	Negative
C-E	-	-	-	Positive

Legend:
- Dual carriageway
- Single carriageway
- Original interregional trade
- Additional interregional trade
- Interregional trade reduction

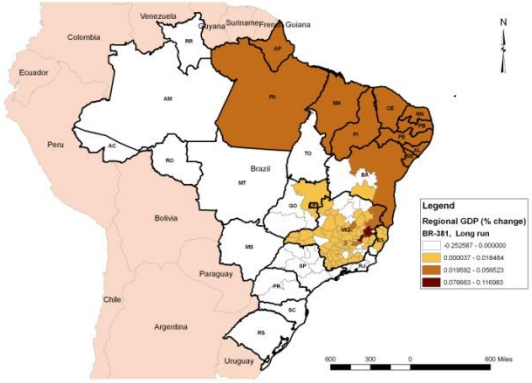
Hypothetical sites:
- **A** Salvador
- **B** Governador Valadares
- **C** Belo Horizonte
- **D** São Paulo
- **E** Curitiba

Spatial GDP effects – BR-381

Short run



Long run



There is thus clearly a situation where spatial competition plays a prominent role. Given the favorable scenario for relative production costs in the Northeast, in a given transport infrastructure context of systemic low quality, that region increases its spatial market area, in deterrence of the richer Southeast, which suffers from the network effects.

Final remarks

Isolated projects may promote undesirable outcomes if not considered within a context of a well-specified program of investments.

The integrated nature of transport systems may induce policymakers to achieve mistakes when designing programs without sound knowledge of this property.

How about different levels of government?

- Policymakers in Minas Gerais may have special interests in such projects, given their strategic role in the state transport network.

State results – Minas Gerais

	BR-262		*BR-381*	
	SR	*LR*	*SR*	*LR*
Real GDP	0,00765	0,01554	0,00532	0,00686
Aggregate employment, wage bill weights	(0,00020)	0,00683	(0,00101)	(0,00075)
Equivalent variation – total (change in $ 1,000,000)	15,4	30,1	7,7	(7,5)
Real tax revenue	0,00269	0,01381	0,00297	0,00425
Terms of trade	(0,00024)	(0,00216)	(0,00001)	(0,00274)
Custo Minas	(0,00379)	(0,02270)	(0,00870)	(0,00629)
Regional concentration	(0,00757)	(0,01528)	(0,00478)	(0,00640)
Poverty	(0,28963)	(1,12426)	(0,16286)	(0,28925)

What do the State results tell us?

Common patterns appear related to aggregate effects of both projects with Minas Gerais.

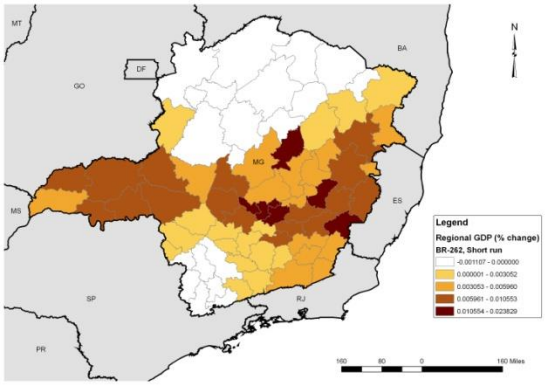
In general, positive outcomes are stronger in the BR-262 project than in the BR-381 project. However, **they go in the same direction for most of the indicators**.

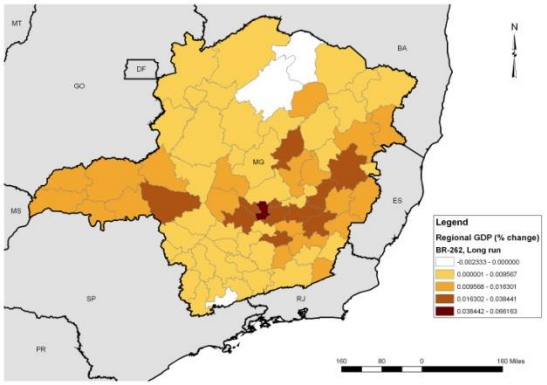
- Overall, gains in **efficiency** (real GDP growth) are positive, with bigger impacts occurring in the long run.
- **Real tax revenue** also follows the same pattern.
- **Competitiveness indicators** suggest improvements in the terms of trade with other countries, and a reduction in the *Custo Minas* – measured in terms of the state GDP deflator.
- Both projects are **pro-concentration**, but it happens to a lesser degree in the BR-381 project.
- Both projects are also **pro-poor**, projecting reductions in the headcount poverty index for the State of Minas Gerais.

Spatial GDP effects – Minas Gerais

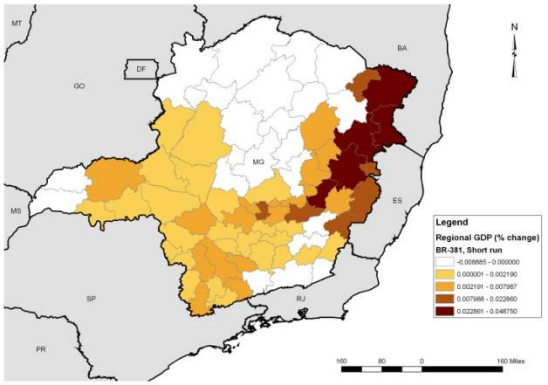
Short run ***Long run***

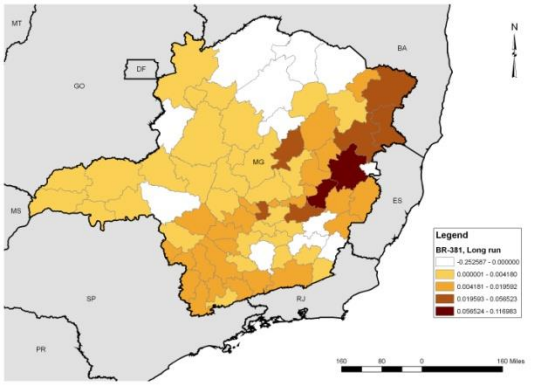
BR-262





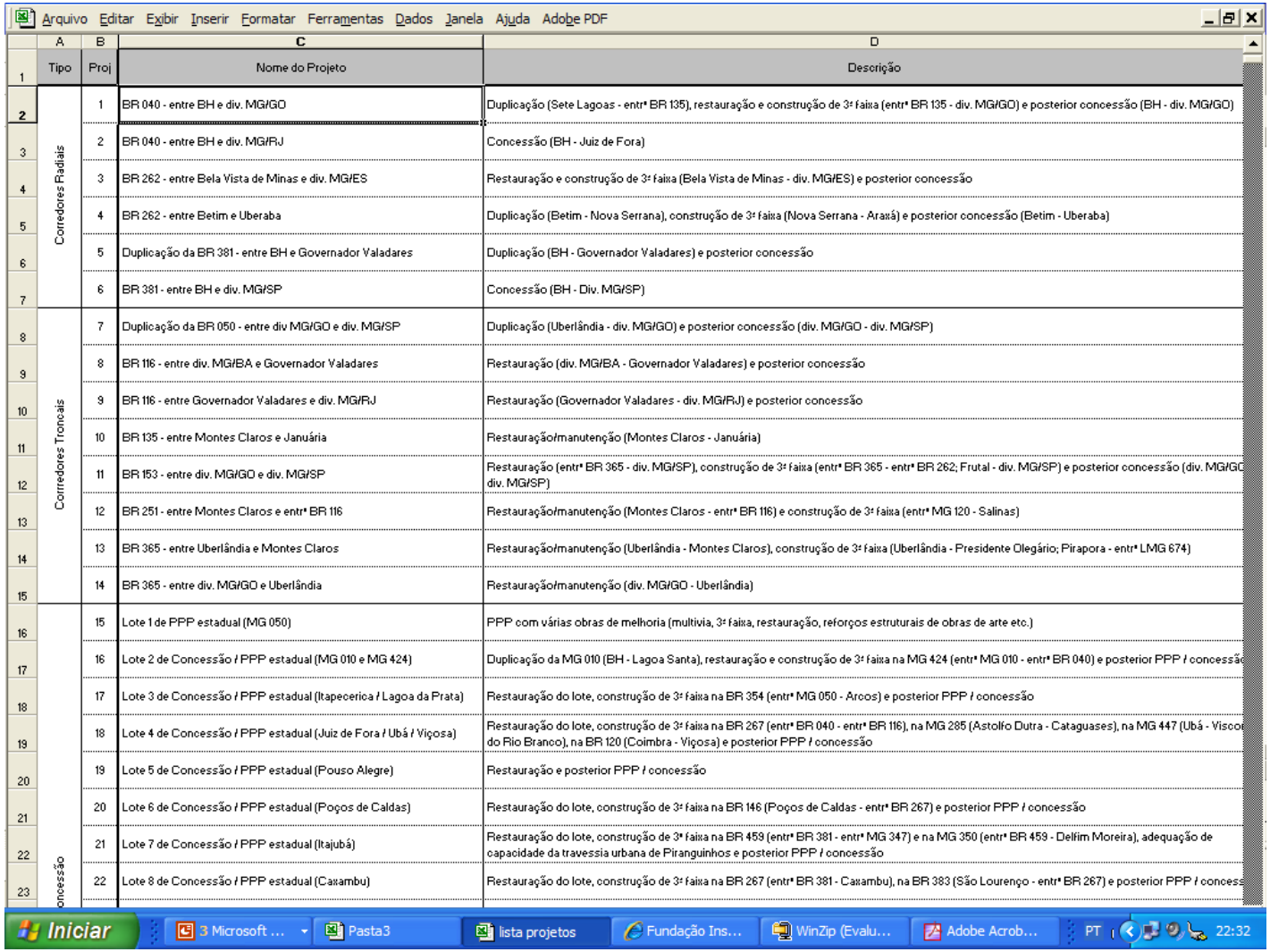
BR-381





Overall, the stronger effects on the areas of influence of the projects are clearly perceived. Moreover, these effects tend to spread over time, as suggested by the smaller number of regions presenting negative performance in the long run.

Pelt Minas – lista de projetos



Arquivo Editar Exibir Inserir Formatar Ferramentas Dados Janela Ajuda Adobe PDF

	A	B	C	D
1	Tipo	Proj	Nome do Projeto	Descrição
2	Corredores Radiais	1	BR 040 - entre BH e div. MG/GO	Duplicação (Sete Lagoas - entr* BR 135), restauração e construção de 3ª faixa (entr* BR 135 - div. MG/GO) e posterior concessão (BH - div. MG/GO)
3		2	BR 040 - entre BH e div. MG/RJ	Concessão (BH - Juiz de Fora)
4		3	BR 262 - entre Bela Vista de Minas e div. MG/ES	Restauração e construção de 3ª faixa (Bela Vista de Minas - div. MG/ES) e posterior concessão
5		4	BR 262 - entre Betim e Uberaba	Duplicação (Betim - Nova Serrana), construção de 3ª faixa (Nova Serrana - Araxá) e posterior concessão (Betim - Uberaba)
6		5	Duplicação da BR 381 - entre BH e Governador Valadares	Duplicação (BH - Governador Valadares) e posterior concessão
7		6	BR 381 - entre BH e div. MG/SP	Concessão (BH - Div. MG/SP)
8	Corredores Troncais	7	Duplicação da BR 050 - entre div MG/GO e div. MG/SP	Duplicação (Uberlândia - div. MG/GO) e posterior concessão (div. MG/GO - div. MG/SP)
9		8	BR 116 - entre div. MG/BA e Governador Valadares	Restauração (div. MG/BA - Governador Valadares) e posterior concessão
10		9	BR 116 - entre Governador Valadares e div. MG/RJ	Restauração (Governador Valadares - div. MG/RJ) e posterior concessão
11		10	BR 135 - entre Montes Claros e Januária	Restauração/manutenção (Montes Claros - Januária)
12		11	BR 153 - entre div. MG/GO e div. MG/SP	Restauração (entr* BR 365 - div. MG/SP), construção de 3ª faixa (entr* BR 365 - entr* BR 262; Frutal - div. MG/SP) e posterior concessão (div. MG/GO - div. MG/SP)
13		12	BR 251 - entre Montes Claros e entr* BR 116	Restauração/manutenção (Montes Claros - entr* BR 116) e construção de 3ª faixa (entr* MG 120 - Salinas)
14		13	BR 365 - entre Uberlândia e Montes Claros	Restauração/manutenção (Uberlândia - Montes Claros), construção de 3ª faixa (Uberlândia - Presidente Olegário; Pirapora - entr* LMG 674)
15		14	BR 365 - entre div. MG/GO e Uberlândia	Restauração/manutenção (div. MG/GO - Uberlândia)
16	oncessão	15	Lote 1 de PPP estadual (MG 050)	PPP com várias obras de melhoria (multivia, 3ª faixa, restauração, reforços estruturais de obras de arte etc.)
17		16	Lote 2 de Concessão / PPP estadual (MG 010 e MG 424)	Duplicação da MG 010 (BH - Lagoa Santa), restauração e construção de 3ª faixa na MG 424 (entr* MG 010 - entr* BR 040) e posterior PPP / concessão
18		17	Lote 3 de Concessão / PPP estadual (Itapecerica / Lagoa da Prata)	Restauração do lote, construção de 3ª faixa na BR 354 (entr* MG 050 - Arcos) e posterior PPP / concessão
19		18	Lote 4 de Concessão / PPP estadual (Juiz de Fora / Ubá / Viçosa)	Restauração do lote, construção de 3ª faixa na BR 267 (entr* BR 040 - entr* BR 116), na MG 285 (Astolfo Dutra - Cataguases), na MG 447 (Ubá - Visconde do Rio Branco), na BR 120 (Coimbra - Viçosa) e posterior PPP / concessão
20		19	Lote 5 de Concessão / PPP estadual (Pouso Alegre)	Restauração e posterior PPP / concessão
21		20	Lote 6 de Concessão / PPP estadual (Poços de Caldas)	Restauração do lote, construção de 3ª faixa na BR 146 (Poços de Caldas - entr* BR 267) e posterior PPP / concessão
22		21	Lote 7 de Concessão / PPP estadual (Itajubá)	Restauração do lote, construção de 3ª faixa na BR 459 (entr* BR 381 - entr* MG 347) e na MG 350 (entr* BR 459 - Delfim Moreira), adequação de capacidade da travessia urbana de Piranguinhos e posterior PPP / concessão
23		22	Lote 8 de Concessão / PPP estadual (Caxambu)	Restauração do lote, construção de 3ª faixa na BR 267 (entr* BR 381 - Caxambu), na BR 383 (São Lourenço - entr* BR 267) e posterior PPP / concess

Iniciar | 3 Microsoft ... | Pasta3 | lista projetos | Fundação Ins... | WinZip (Evalu... | Adobe Acrob... | PT | 22:32

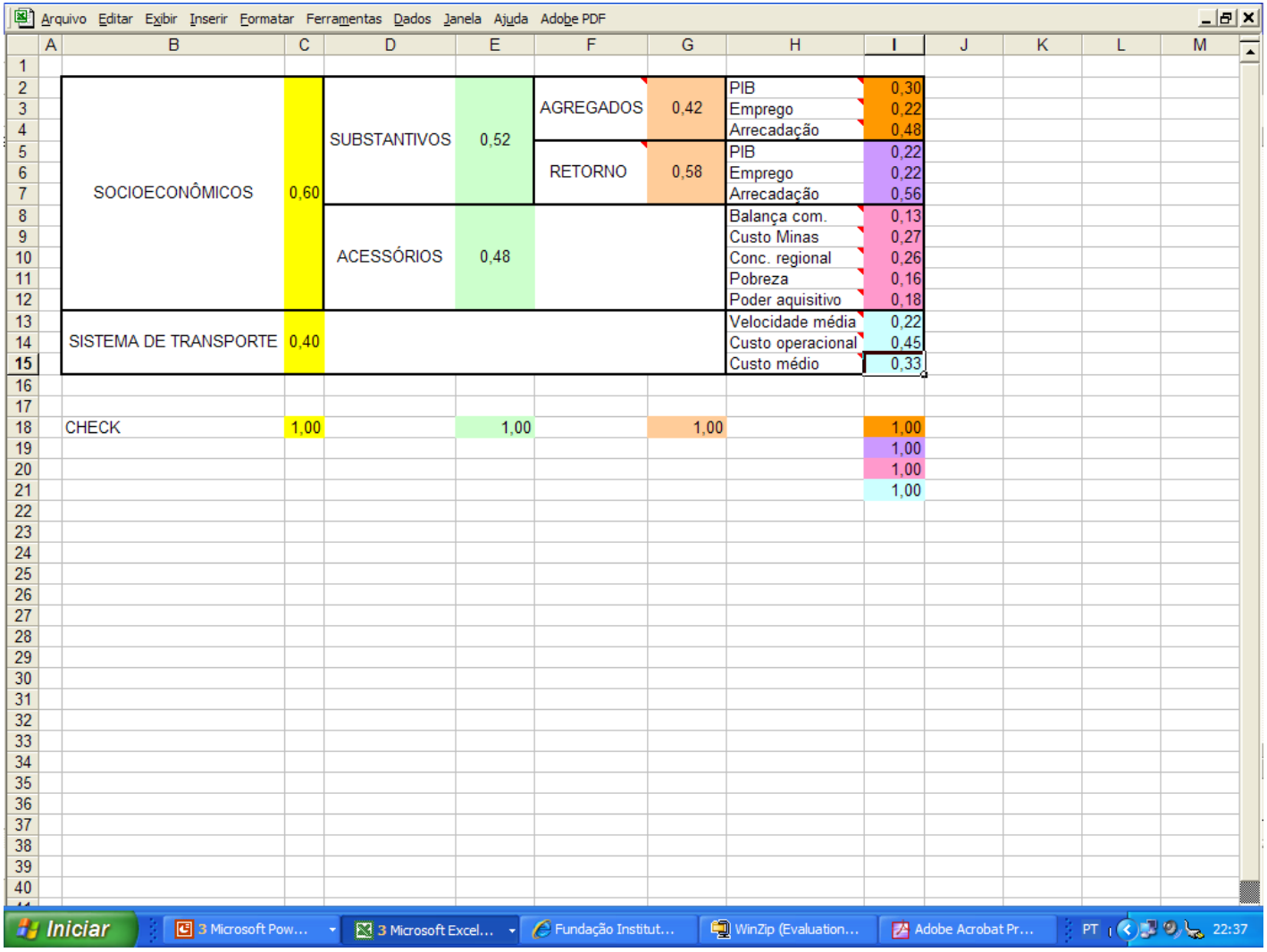
Pelt Minas – lista de atributos (impactos)

Arquivo Editar Exibir Inserir Formatar Ferramentas Dados Janela Ajuda Adobe PDF

	INDICADORES	DEFINIÇÃO	DIMENSÃO	FONTE
	Indicadores socioeconômicos			
	Substantivos			
	Agregados	*Impactos globais de cada projeto*	*Valores absolutos*	
	PIB	Variação percentual no PIB de MG	Eficiência econômica	Modelo BMMG
	Emprego	Variação percentual no emprego em MG	Crescimento	Modelo BMMG
	Arrecadação	Variação percentual na arrecadação de ICMS em MG	Fiscal	Modelo BMMG
	Retorno	*Impactos por R$ investido em cada projeto*	*Eficácia dos gastos*	
	PIB	Variação no PIB de MG por R$ investido	Eficiência econômica	Modelo BMMG
	Emprego	Variação no emprego em MG por R$ investido	Crescimento	Modelo BMMG
	Arrecadação	Variação na arrecadação de ICMS em MG por R$ investido	Fiscal	Modelo BMMG
	Acessórios			
	Balança comercial	Variação percentual no quantum exportado (-) variação percentual no quantum importado, preços constantes	Competitividade internacional	Modelo BMMG
	Custo Minas	Variação percentual no deflator implícito do PIB de MG	Competitividade sistêmica	Modelo BMMG
	Concentração regional	Variação percentual no PIB das regiões Norte e Jequitinhonha/Mucuri (-) variação percentual no PIB de MG (melhoria relativa das regiões pobres)	Desigualdade regional	Modelo BMMG
	Pobreza	Redução na proporção de pobres na população de MG	Desigualdade social	Modelo BMMG + Microssimulação
	Poder aquisitivo	Aumento da capacidade de acesso a bens e serviços por parte da população mineira; equivale ao aumento da renda real das famílias	Bem-estar da população	Modelo BMMG

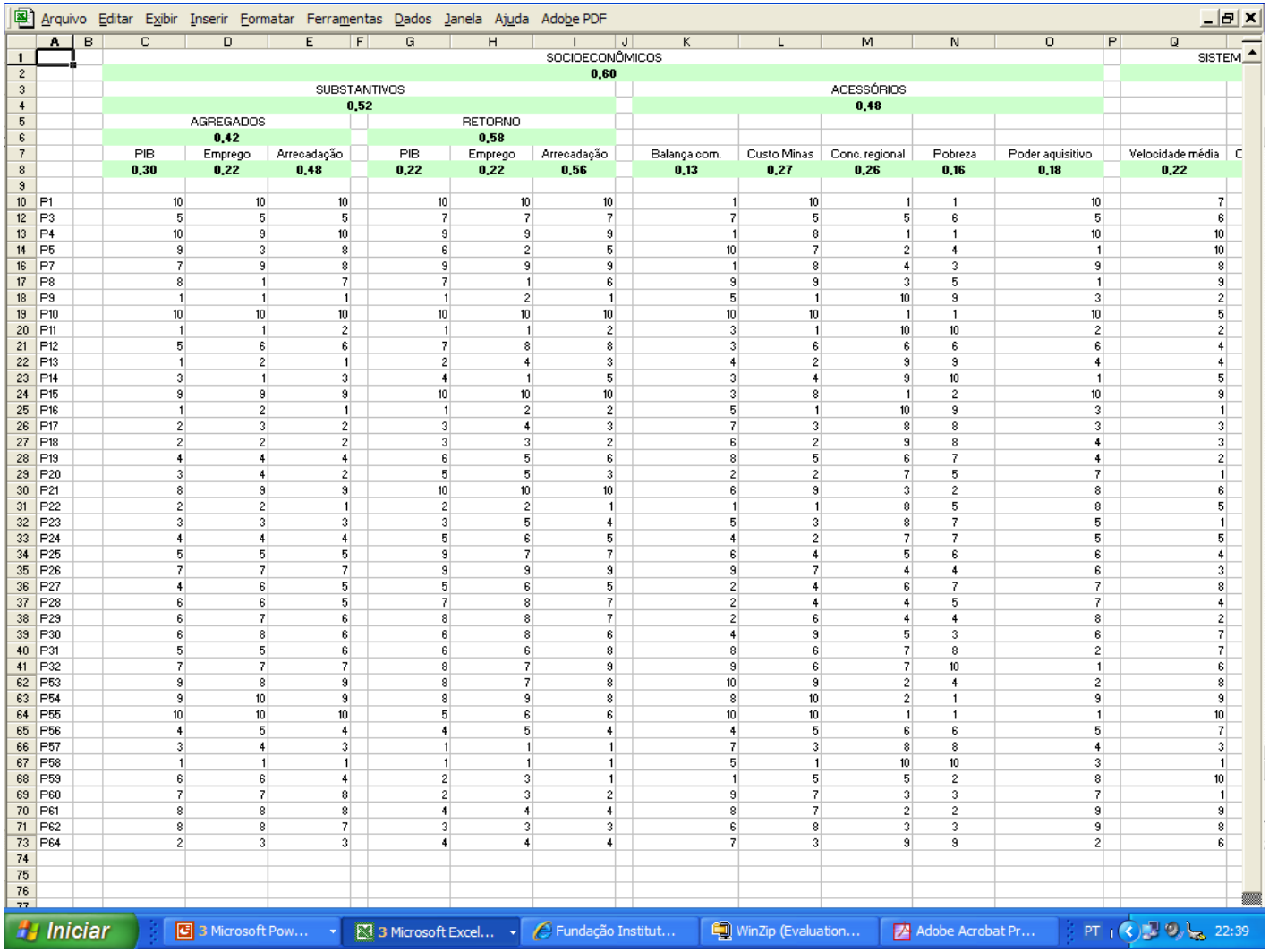
Iniciar | 3 Microsoft Pow... | 3 Microsoft Excel... | Fundação Institut... | WinZip (Evaluation... | Adobe Acrobat Pr... | PT | 22:36

Pelt Minas – pesos



SOCIOECONÔMICOS	0,60	SUBSTANTIVOS	0,52	AGREGADOS	0,42	PIB	0,30
						Emprego	0,22
						Arrecadação	0,48
				RETORNO	0,58	PIB	0,22
						Emprego	0,22
						Arrecadação	0,56
		ACESSÓRIOS	0,48			Balança com.	0,13
						Custo Minas	0,27
						Conc. regional	0,26
						Pobreza	0,16
						Poder aquisitivo	0,18
SISTEMA DE TRANSPORTE	0,40					Velocidade média	0,22
						Custo operacional	0,45
						Custo médio	0,33
CHECK	1,00		1,00		1,00		1,00
							1,00
							1,00
							1,00

Pelt Minas – notas

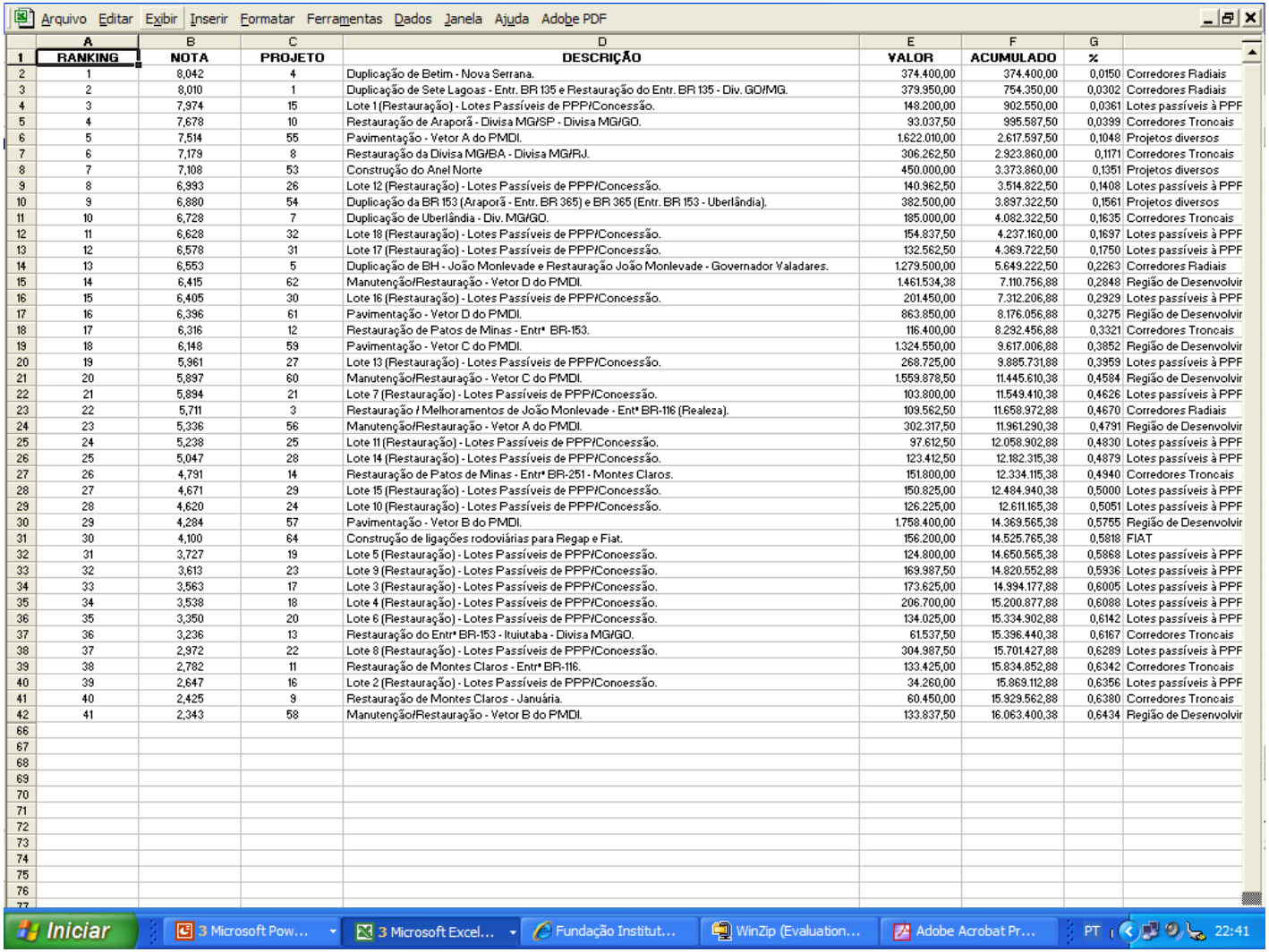


Arquivo Editar Exibir Inserir Formatar Ferramentas Dados Janela Ajuda Adobe PDF

1			SOCIOECONÔMICOS													SISTEM	
2			0,60														
3			SUBSTANTIVOS						ACESSÓRIOS								
4			0,52						0,48								
5			AGREGADOS				RETORNO										
6			0,42				0,58										
7		PIB	Emprego	Arrecadação		PIB	Emprego	Arrecadação	Balança com.	Custo Minas	Conc. regional	Pobreza	Poder aquisitivo	Velocidade média	C		
8		0,30	0,22	0,48		0,22	0,22	0,56	0,13	0,27	0,26	0,16	0,18	0,22			
9																	
10	P1	10	10	10		10	10	10	1	10	1	1	10	7			
12	P3	5	5	5		7	7	7	7	5	5	6	5	6			
13	P4	10	9	10		9	9	9	1	8	1	1	10	10			
14	P5	9	3	8		6	2	5	10	7	2	4	1	10			
16	P7	7	9	8		9	9	9	1	8	4	3	9	8			
17	P8	8	1	7		7	1	6	9	9	3	5	1	9			
18	P9	1	1	1		1	2	1	5	1	10	9	3	2			
19	P10	10	10	10		10	10	10	10	10	1	1	10	5			
20	P11	1	1	2		1	1	2	3	1	10	10	2	2			
21	P12	5	6	6		7	8	8	3	6	6	6	6	4			
22	P13	1	2	1		2	4	3	4	2	9	9	4	4			
23	P14	3	1	3		4	1	5	3	4	9	10	1	5			
24	P15	9	9	9		10	10	10	3	8	1	2	10	9			
25	P16	1	2	1		1	2	2	5	1	10	9	3	1			
26	P17	2	3	2		3	4	3	7	3	8	8	3	3			
27	P18	2	2	2		3	3	2	6	2	9	8	4	3			
28	P19	4	4	4		6	5	6	8	5	6	7	4	2			
29	P20	3	4	2		5	5	3	2	2	7	5	7	1			
30	P21	8	9	9		10	10	10	6	9	3	2	8	6			
31	P22	2	2	1		2	2	1	1	1	8	5	8	5			
32	P23	3	3	3		3	5	4	5	3	8	7	5	1			
33	P24	4	4	4		5	6	5	4	2	7	7	5	5			
34	P25	5	5	5		9	7	7	6	4	5	6	6	4			
35	P26	7	7	7		9	9	9	9	7	4	4	6	3			
36	P27	4	6	5		5	6	5	2	4	6	7	7	8			
37	P28	6	6	5		7	8	7	2	4	4	5	7	4			
38	P29	6	7	6		8	8	7	2	6	4	4	8	2			
39	P30	6	8	6		6	8	6	4	9	5	3	6	7			
40	P31	5	5	6		6	6	8	8	6	7	8	2	7			
41	P32	7	7	7		8	7	9	9	6	7	10	1	6			
62	P53	9	8	9		8	7	8	10	9	2	4	2	8			
63	P54	9	10	9		8	9	8	8	10	2	1	9	9			
64	P55	10	10	10		5	6	6	10	10	1	1	1	10			
65	P56	4	5	4		4	5	4	4	5	6	6	5	7			
66	P57	3	4	3		1	1	1	7	3	8	8	4	3			
67	P58	1	1	1		1	1	1	5	1	10	10	3	1			
68	P59	6	6	4		2	3	1	1	5	5	2	8	10			
69	P60	7	7	8		2	3	2	9	7	3	3	7	1			
70	P61	8	8	8		4	4	4	8	7	2	2	9	9			
71	P62	8	8	7		3	3	3	6	8	3	3	9	8			
73	P64	2	3	3		4	4	4	7	3	9	9	2	6			
74																	
75																	
76																	

Iniciar | 3 Microsoft Pow... | 3 Microsoft Excel... | Fundação Institut... | WinZip (Evaluation... | Adobe Acrobat Pr... | PT | 22:39

Pelt Minas – hierarquia



Arquivo Editar Exibir Inserir Formatar Ferramentas Dados Janela Ajuda Adobe PDF

	A	B	C	D	E	F	G	
1	RANKING	NOTA	PROJETO	DESCRIÇÃO	VALOR	ACUMULADO	%	
2	1	8,042	4	Duplicação de Betim - Nova Serrana.	374.400,00	374.400,00	0,0150	Corredores Radiais
3	2	8,010	1	Duplicação de Sete Lagoas - Entr. BR 135 e Restauração do Entr. BR 135 - Div. GO/MG.	379.950,00	754.350,00	0,0302	Corredores Radiais
4	3	7,974	15	Lote 1 (Restauração) - Lotes Passíveis de PPP/Concessão.	148.200,00	902.550,00	0,0361	Lotes passíveis à PPF
5	4	7,678	10	Restauração de Araporã - Divisa MG/SP - Divisa MG/GO.	93.037,50	995.587,50	0,0399	Corredores Troncais
6	5	7,514	55	Pavimentação - Vetor A do PMDI.	1.622.010,00	2.617.597,50	0,1048	Projetos diversos
7	6	7,179	8	Restauração da Divisa MG/BA - Divisa MG/RJ.	306.262,50	2.923.860,00	0,1171	Corredores Troncais
8	7	7,108	53	Construção do Anel Norte	450.000,00	3.373.860,00	0,1351	Projetos diversos
9	8	6,993	26	Lote 12 (Restauração) - Lotes Passíveis de PPP/Concessão.	140.962,50	3.514.822,50	0,1408	Lotes passíveis à PPF
10	9	6,880	54	Duplicação da BR 153 (Araporã - Entr. BR 365) e BR 365 (Entr. BR 153 - Uberlândia).	382.500,00	3.897.322,50	0,1561	Projetos diversos
11	10	6,728	7	Duplicação de Uberlândia - Div. MG/GO.	185.000,00	4.082.322,50	0,1635	Corredores Troncais
12	11	6,628	32	Lote 18 (Restauração) - Lotes Passíveis de PPP/Concessão.	154.837,50	4.237.160,00	0,1697	Lotes passíveis à PPF
13	12	6,578	31	Lote 17 (Restauração) - Lotes Passíveis de PPP/Concessão.	132.562,50	4.369.722,50	0,1750	Lotes passíveis à PPF
14	13	6,553	5	Duplicação de BH - João Monlevade e Restauração João Monlevade - Governador Valadares.	1.279.500,00	5.649.222,50	0,2263	Corredores Radiais
15	14	6,415	62	Manutenção/Restauração - Vetor D do PMDI.	1.461.534,38	7.110.756,88	0,2848	Região de Desenvolvir
16	15	6,405	30	Lote 16 (Restauração) - Lotes Passíveis de PPP/Concessão.	201.450,00	7.312.206,88	0,2929	Lotes passíveis à PPF
17	16	6,396	61	Pavimentação - Vetor D do PMDI.	863.850,00	8.176.056,88	0,3275	Região de Desenvolvir
18	17	6,316	12	Restauração de Patos de Minas - Entrª BR-153.	116.400,00	8.292.456,88	0,3321	Corredores Troncais
19	18	6,148	59	Pavimentação - Vetor C do PMDI.	1.324.550,00	9.617.006,88	0,3852	Região de Desenvolvir
20	19	5,961	27	Lote 13 (Restauração) - Lotes Passíveis de PPP/Concessão.	268.725,00	9.885.731,88	0,3959	Lotes passíveis à PPF
21	20	5,897	60	Manutenção/Restauração - Vetor C do PMDI.	1.559.878,50	11.445.610,38	0,4584	Região de Desenvolvir
22	21	5,894	21	Lote 7 (Restauração) - Lotes Passíveis de PPP/Concessão.	103.800,00	11.549.410,38	0,4626	Lotes passíveis à PPF
23	22	5,711	3	Restauração / Melhoramentos de João Monlevade - Entª BR-116 (Realeza).	109.562,50	11.658.972,88	0,4670	Corredores Radiais
24	23	5,336	56	Manutenção/Restauração - Vetor A do PMDI.	302.317,50	11.961.290,38	0,4791	Região de Desenvolvir
25	24	5,238	25	Lote 11 (Restauração) - Lotes Passíveis de PPP/Concessão.	97.612,50	12.058.902,88	0,4830	Lotes passíveis à PPF
26	25	5,047	28	Lote 14 (Restauração) - Lotes Passíveis de PPP/Concessão.	123.412,50	12.182.315,38	0,4879	Lotes passíveis à PPF
27	26	4,791	14	Restauração de Patos de Minas - Entrª BR-251 - Montes Claros.	151.800,00	12.334.115,38	0,4940	Corredores Troncais
28	27	4,671	29	Lote 15 (Restauração) - Lotes Passíveis de PPP/Concessão.	150.825,00	12.484.940,38	0,5000	Lotes passíveis à PPF
29	28	4,620	24	Lote 10 (Restauração) - Lotes Passíveis de PPP/Concessão.	126.225,00	12.611.165,38	0,5051	Lotes passíveis à PPF
30	29	4,284	57	Pavimentação - Vetor B do PMDI.	1.758.400,00	14.369.565,38	0,5755	Região de Desenvolvir
31	30	4,100	64	Construção de ligações rodoviárias para Regap e Fiat.	156.200,00	14.525.765,38	0,5818	FIAT
32	31	3,727	19	Lote 5 (Restauração) - Lotes Passíveis de PPP/Concessão.	124.800,00	14.650.565,38	0,5868	Lotes passíveis à PPF
33	32	3,613	23	Lote 9 (Restauração) - Lotes Passíveis de PPP/Concessão.	169.987,50	14.820.552,88	0,5936	Lotes passíveis à PPF
34	33	3,563	17	Lote 3 (Restauração) - Lotes Passíveis de PPP/Concessão.	173.625,00	14.994.177,88	0,6005	Lotes passíveis à PPF
35	34	3,538	18	Lote 4 (Restauração) - Lotes Passíveis de PPP/Concessão.	206.700,00	15.200.877,88	0,6088	Lotes passíveis à PPF
36	35	3,350	20	Lote 6 (Restauração) - Lotes Passíveis de PPP/Concessão.	134.025,00	15.334.902,88	0,6142	Lotes passíveis à PPF
37	36	3,236	13	Restauração do Entrª BR-153 - Ituiutaba - Divisa MG/GO.	61.537,50	15.396.440,38	0,6167	Corredores Troncais
38	37	2,972	22	Lote 8 (Restauração) - Lotes Passíveis de PPP/Concessão.	304.987,50	15.701.427,88	0,6289	Lotes passíveis à PPF
39	38	2,782	11	Restauração de Montes Claros - Entrª BR-116.	133.425,00	15.834.852,88	0,6342	Corredores Troncais
40	39	2,647	16	Lote 2 (Restauração) - Lotes Passíveis de PPP/Concessão.	34.260,00	15.869.112,88	0,6356	Lotes passíveis à PPF
41	40	2,425	9	Restauração de Montes Claros - Januária.	60.450,00	15.929.562,88	0,6380	Corredores Troncais
42	41	2,343	58	Manutenção/Restauração - Vetor B do PMDI.	133.837,50	16.063.400,38	0,6434	Região de Desenvolvir

Iniciar | 3 Microsoft Pow... | 3 Microsoft Excel... | Fundação Institut... | WinZip (Evaluation... | Adobe Acrobat Pr... | PT | 22:41

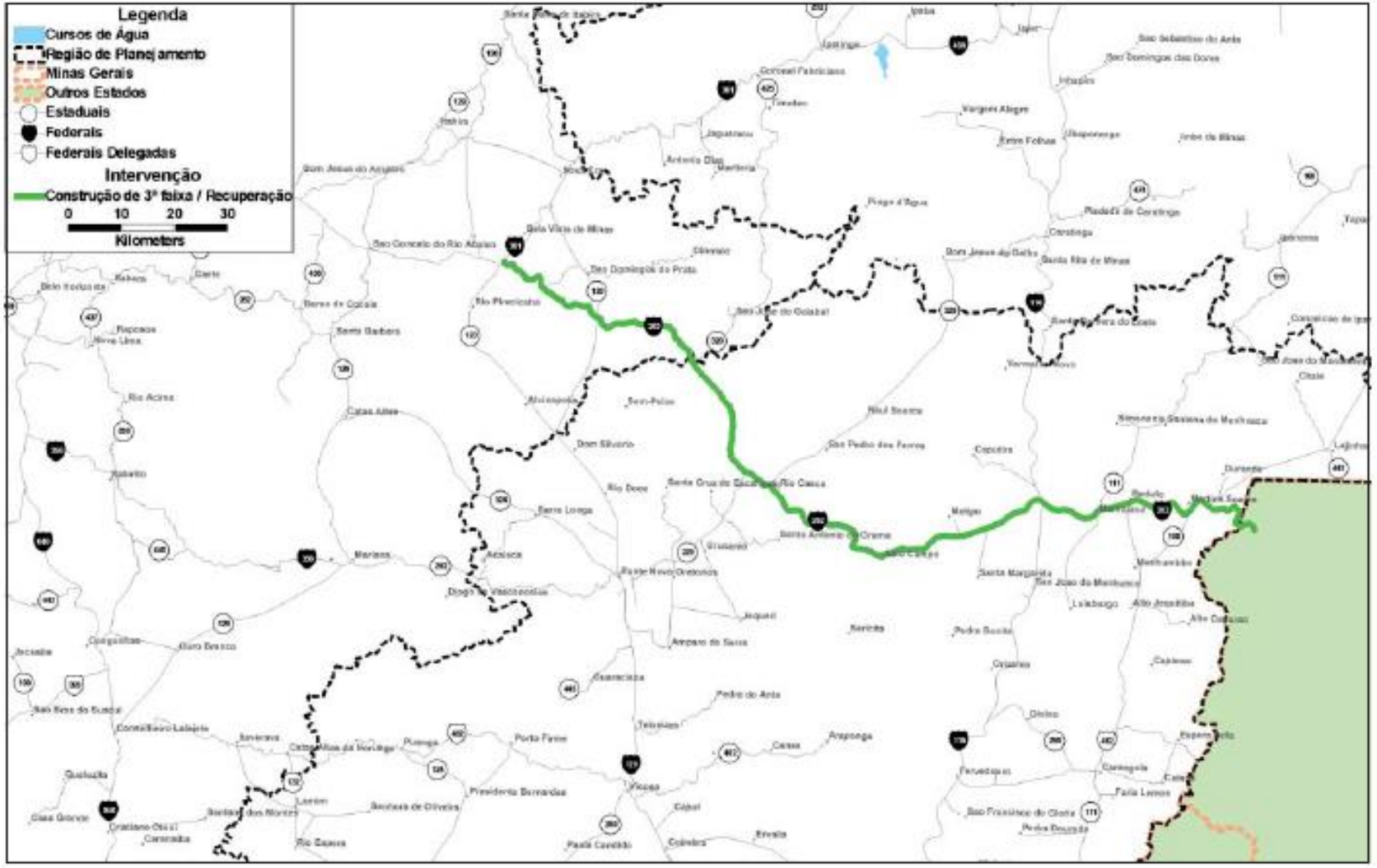
Projeto Rodoviário R3:

BR 262 – entre entr. p/ Bela Vista de Minas e div. MG/ES

Descrição: Recuperação e construção de 3ª faixa (entr. p/ Bela Vista de Minas – div. MG/ES) e posterior concessão

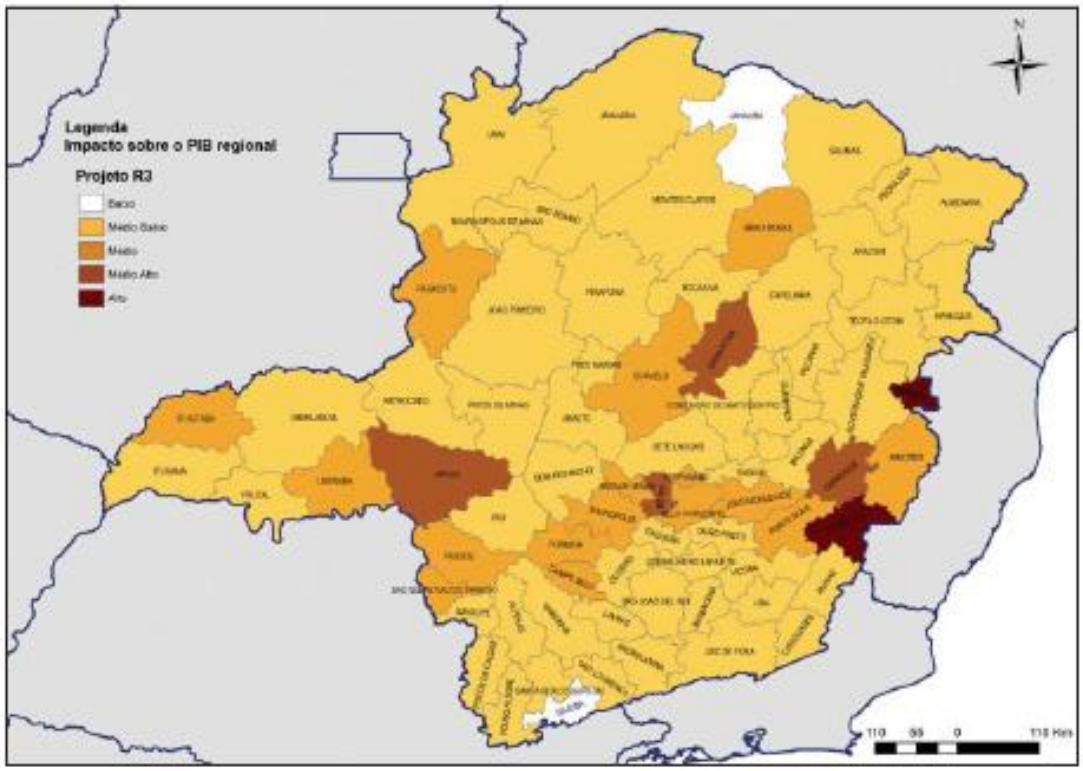
- **Recuperação / Aumento de Capacidade**
  Trecho: Bela Vista de Minas – Div. MG/ES
  Ext. (km): 144,6
  Custo da obra (R$ milhões): 90,4
- **Concessão**
  Trecho: Bela Vista de Minas – Div. MG/ES
  Ext. (km): 195,2

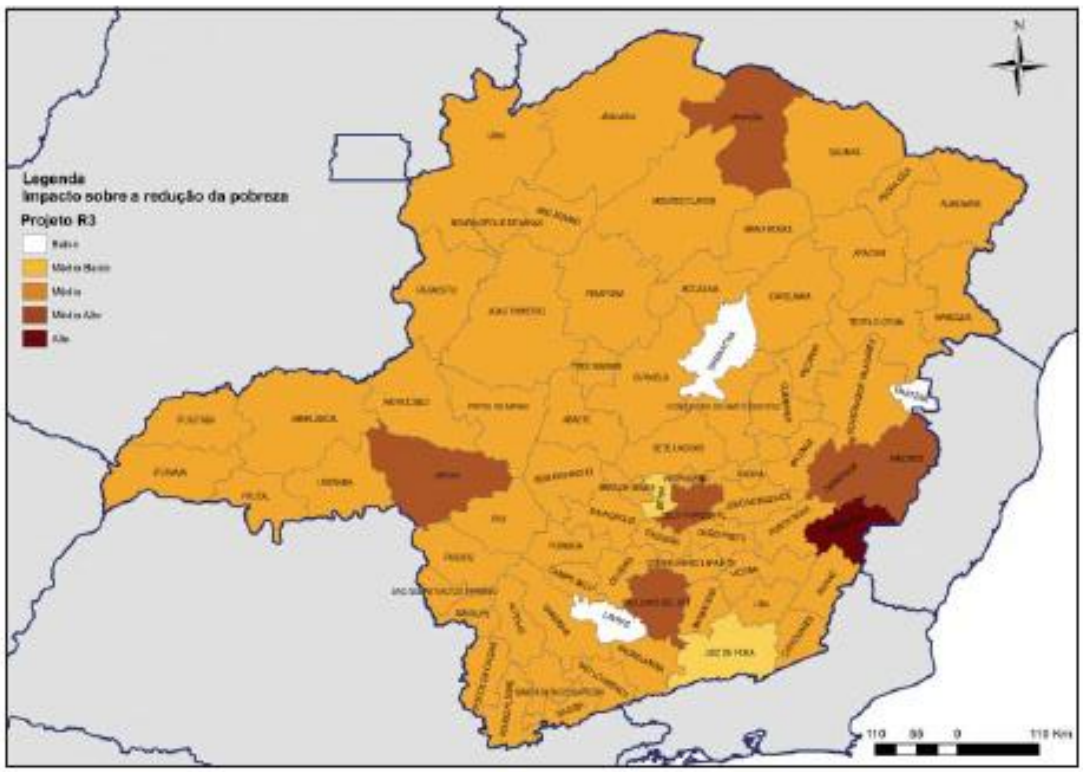
Custo total estimado das intervenções (R$ milhões): 90,4


Legenda
Cursos de Água
Região de Planejamento
Minas Gerais
Outros Estados
Estaduais
Federais
Federais Delegadas
Intervenção
Construção de 3ª faixa / Recuperação
0 10 20 30
Kilometers

Indicador (toda a rede)	R3						Variação (em relação a 2007)					
	Auto	Ônibus	C2e	C3e	C5e	Total	Auto	Ônibus	C2e	C3e	C5e	Total
Velocidade média (km/h)	76,7	71,2	72,2	75,6	73,3	75,0	0,06%	0,04%	0,11%	0,02%	0,10%	0,06%
Custo oper. médio (R$/km/veic.)	0,65	1,74	1,73	2,50	3,45	1,74	(0,05%)	(0,06%)	(0,08%)	(0,03%)	(0,14%)	(0,08%)
Custo oper. total (R$ milhões)	7.869	2.176	4.942	13.462	18.559	47.009	(R$ 4)	(R$ 1)	(R$ 3)	(R$ 5)	(R$ 27)	(R$ 39)

Indicador (na rede MG)	R3						Variação (em relação a 2007)					
	Auto	Ônibus	C2e	C3e	C5e	Total	Auto	Ônibus	C2e	C3e	C5e	Total
Velocidade média (km/h)	72,1	69,0	68,7	72,9	71,7	71,6	0,09%	0,07%	0,18%	0,05%	0,18%	0,11%
Custo oper. médio (R$/km/veic.)	0,65	1,75	1,75	2,52	3,44	1,68	(0,08%)	(0,10%)	(0,14%)	(0,07%)	(0,26%)	(0,16%)
Custo oper. total (R$ milhões)	4.763	1.296	2.811	6.723	10.184	25.777	(R$ 3)	(R$ 1)	(R$ 4)	(R$ 4)	(R$ 26)	(R$ 39)


Legenda
Impacto sobre o PIB regional
Projeto R3
Baixo
Médio Baixo
Médio
Médio Alto
Alto
N
110 55 0 110 Kms


Legenda
Impacto sobre a redução da pobreza
Projeto R3
N
110 55 0 110 Kms

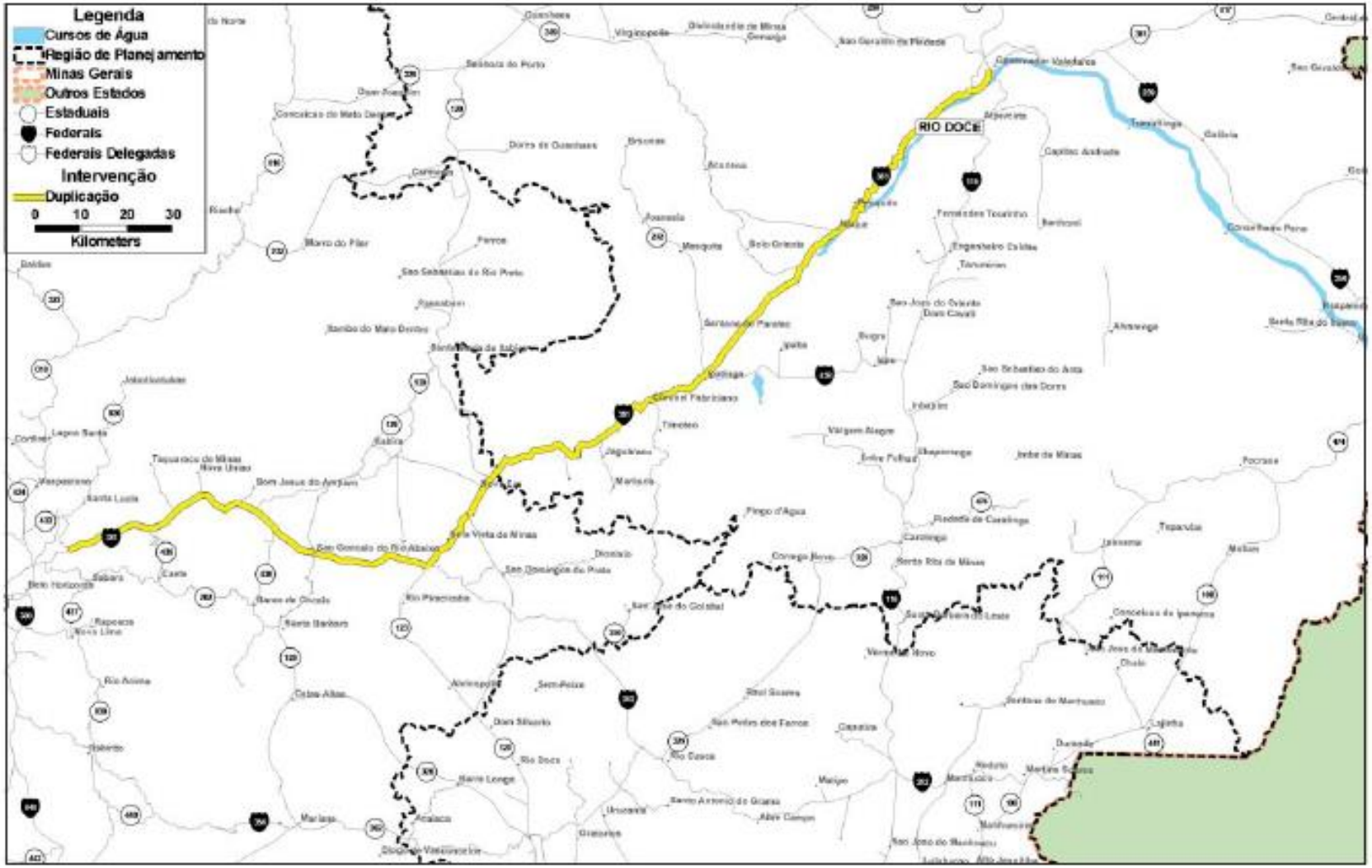
Projeto Rodoviário R5:

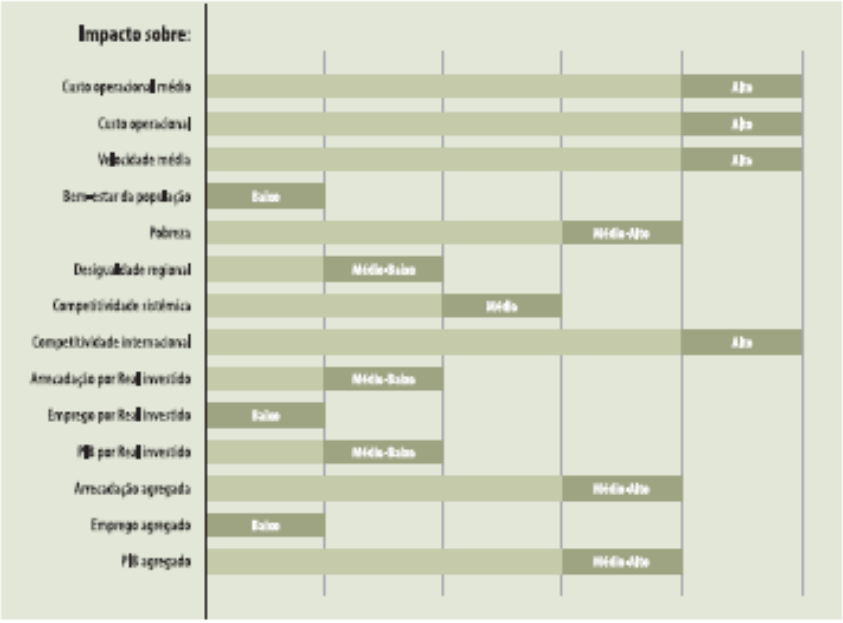
Duplicação da BR 381 – entre BH e Governador Valadares

Descrição: Duplicação (BH – Governador Valadares) e posterior concessão

- **Duplicação**
  Trecho: Belo Horizonte – Governador Valadares
  Ext. (km): 310,0
  Custo da obra (R$ milhões): 1.395,0
- **Concessão**
  Trecho: Belo Horizonte – Governador Valadares
  Ext. (km): 310,0

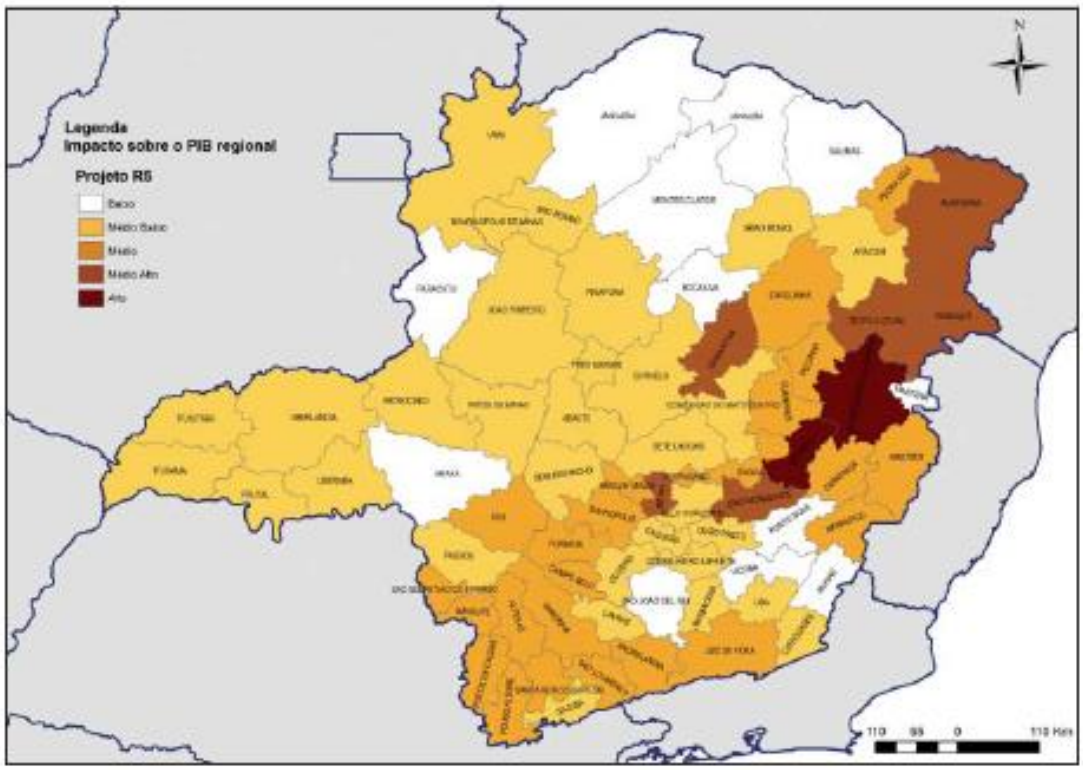
Custo total estimado das intervenções (R$ milhões): 1.395,0

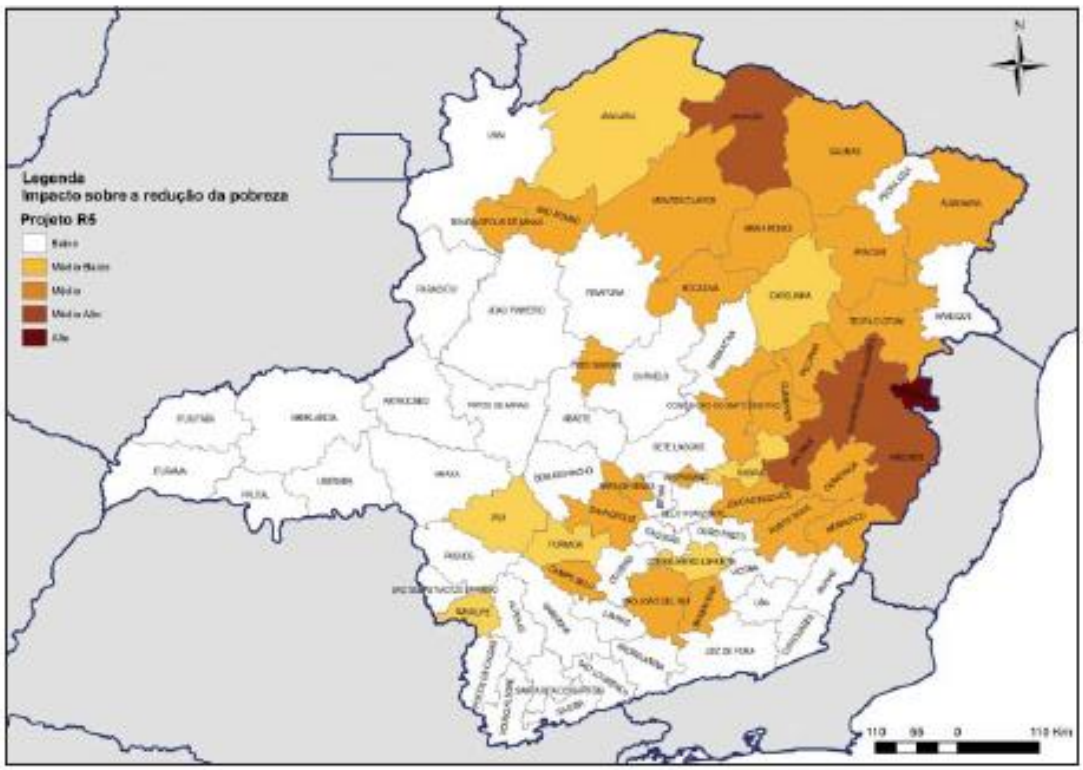

Legenda
Cursos de Água
Região de Planejamento
Minas Gerais
Outros Estados
Estaduais
Federais
Federais Delegadas
Intervenção
Duplicação
0 10 20 30
Kilometers
RIO DOCE



Indicador (toda a rede)	R5						Variação (em relação a 2007)					
	Auto	Ônibus	C2e	C3e	C5e	Total	Auto	Ônibus	C2e	C3e	C5e	Total
Velocidade média (km/h)	77,9	72,6	73,2	76,5	75,0	76,2	1,53%	1,92%	1,45%	1,27%	2,41%	1,67%
Custo oper. médio (R$/km/veic.)	0,64	1,72	1,72	2,49	3,43	1,73	(0,50%)	(1,01%)	(0,68%)	(0,26%)	(0,56%)	(0,50%)
Custo oper. total (R$ milhões)	7.836	2.157	4.916	13.436	18.484	46.829	(R$ 37)	(R$ 21)	(R$ 29)	(R$ 31)	(R$ 101)	(R$ 219)

Indicador (na rede MG)	R5						Variação (em relação a 2007)					
	Auto	Ônibus	C2e	C3e	C5e	Total	Auto	Ônibus	C2e	C3e	C5e	Total
Velocidade média (km/h)	73,8	71,1	70,4	74,6	74,7	73,6	2,41%	3,24%	2,58%	2,50%	4,37%	2,85%
Custo oper. médio (R$/km/veic.)	0,64	1,72	1,74	2,50	3,42	1,67	(0,83%)	(1,68%)	(1,20%)	(0,52%)	(1,02%)	(0,91%)
Custo oper. total (R$ milhões)	4.733	1.285	2.801	6.703	10.114	25.635	(R$ 33)	(R$ 13)	(R$ 14)	(R$ 25)	(R$ 97)	(R$ 181)


Legenda
Impacto sobre o PIB regional
Projeto R5
Baixo
Médio Baixo
Médio
Médio Alto
Alto
N
110 55 0 110 Kms


Legenda
Impacto sobre a redução da pobreza
Projeto R5
N
110 55 0 110 Kms