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Professional Report

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## Belo Horizonte. Portal to the Future. A Vision for Brazil.



*Finis Coronat Opus*

The end crowns the work.

## Contents

Forward .....	3
Executive Summary.....	3
Introduction & Background .....	5
Challenges .....	7
Traffic, Crime & Employment Data .....	10
Analysis & Suggested Plans.....	11
AEROTROPOLIS PLAN .....	11
COMMUNITY & ECONOMIC DEVELOPEMENT .....	20
METRO-MATRIX PLANNING METHOD .....	29
Implementation .....	42
Phasing.....	42
Political Climate .....	43
Financing .....	45
Private Sector Involvement.....	46
Further Study .....	48
Coalition Building & Intergovernmental Relations .....	49
Conclusion.....	50
Works Cited.....	52

## Forward

The City and Regional Planning Program at the University of Texas at Arlington transforms students thinking to look beyond conventional solutions and to push the bounds of what could be. Mayor Greene's Leadership and Communication Skills in Planning forced students to analyze what was in the art of the possible and how to realize the best alternatives within complex municipal systems. Professor Alejandro Rodríguez's Urbanization in the Developing World Course revealed the major role that culture plays in city planning and how comparative urbanism can lead to creative and efficient solutions. Both of these courses have been inspirations for this report. Professor Anjomani through his research, knowledge and experience in metropolitan and international planning has sharpened my own understanding. This report seeks to apply the acquired knowledge from these studies to the dynamic yet troubled Belo Horizonte, Brazil metropolitan area. This report is an ongoing endeavor which I consider my life work and that I intend to continue to pursuing and sharing. It has been a blessing to work with such a talented and dedicated committee.

## Executive Summary

A massive improvement of Belo Horizonte's transportation infrastructure would not only improve the quality of life of the residents of this important metropolitan area, it would positively change the course of Brazil and Iberian America's future by creating a new economic engine, enabling business and enterprise while providing opportunities and prosperity to millions. Belo Horizonte - much like the Dallas Fort-Worth metropolitan area in the United States and the Madrid metropolitan area in Spain - have many similarities. All three metropolitan areas are major, inland centers without navigable waterways and with populations of over 5 million inhabitants. Using Metropolitan Madrid and the Dallas-Fort Worth Metroplex as best practice examples in terms of urban and economic development, this report looks to improve upon the 2015 Master Plan for the Belo Horizonte Metropolitan region produced by the Government of

Minas Gerais through the assistance of the World Bank. This report will propose creative urban planning solutions to the challenges faced by this metropolitan area along with economic and community development strategies that will build upon the unique assets of this region and how to take advantage of them in the new, interconnected, global economy while fostering the uniqueness of this region.

A completely new international airport to be constructed in the southwestern area of Greater Belo Horizonte and a major free trade zone development surrounding it will be the fulcrum to invigorate this region economically. This major development will utilize Belo Horizonte's strategic location to empower and create businesses and generate prosperity for all of its residents. It will benefit the nation's aviation infrastructure by alleviating congestion in São Paulo which currently functions as the main international entry into Brazil and as a national logistics hub. Belo Horizonte will become both a new gateway into Brazil and serve and as a core connecting point for national and regional air traffic. The planned free trade zones surrounding the airport will attract and retain business to induce greater investment in Belo Horizonte.

In turn to accommodate the desired growth to this region and to decongest the *Centro* or Downtown; two modern multipurpose developments will be constructed to the South and Southwest of the city along the new freeway and commuter rail network. These brand new developments will be multiuse and offer the most modern amenities. They shall be a prime location for business, residence and leisure. Also Belo Horizonte's Downtown and Pampulha districts will be redeveloped to their highest and best uses. These additions aspire to attract and retain world class industries and talent to this Metropolitan area. From this intended influx of capital other much needed improvements to the city can be realized. Such as the construction and expansion of regional freeway and mass transit systems. Also these funds can be used to improve services to impoverished and disadvantaged areas. These investments will serve the

region greatly for centuries to come as well as improve the quality of life in the near future to millions of citizens.

## Introduction & Background

The Belo Horizonte metropolitan area is the third largest in the South American nation of Brazil with a population of 5,156,217. It is strategically located 190 miles (300km) inland from the Atlantic Ocean north of São Paulo and Rio de Janeiro, respectively the nation's first and second largest metropolitan areas and southeast of the national capital - Brasilia. Belo Horizonte is the first planned city of modern Brazil (IBGE). It was founded in 1897 to replace the historical city of Ouro Preto as the capital of the state of Minas Gerais. Located at the 20<sup>th</sup> parallel in the southern hemisphere at an elevation of 2,490 feet (760 meters) above sea level, its residents enjoy a pleasant climate with an average temperature of 72 Fahrenheit (22 Celsius) and over 2,500 hours of sunshine per year (Weatherbase). The State of Minas Gerais has the second largest population of Brazil after the State of São Paulo and has the third largest Gross Domestic Product in Brazil with large technological, service, metallurgical, mining, and heavy manufacturing industries (IBGE).

Historically, the mining, siderurgy and ironworks industries have had a more significant role in the region's economy due to the state's considerable mineral wealth. The name of the state *Minas Gerais* translates from Portuguese to "General Mines" due to the abundance of gold, manganese and precious gem stones. Belo Horizonte is the main distribution and processing center of this rich mining and agricultural region. Since the 1990s the economy of Belo Horizonte has expanded its service industry especially in the emerging fields of information technology and biotechnology. Major multinational companies have located themselves within the city of Belo Horizonte and the region (Brazilian Weekly City Briefs).

For instance, Google has located their Latin American research and development center in the city. Italian automobile manufacturer FIAT has a car plant in the suburb of Betim.

There are also steel mills for Gerdau and Arcelor corporations within the metropolitan area. Electronics manufacturer Toshiba also has a subsidiary in the greater Belo Horizonte. Construction corporations such as Mendes Junior have also played a large role in Belo Horizonte's economy just as has energy company CEMIG. Both of these enterprises are headquartered in the city. Other emerging trends include the fashion industry and jewelry manufacturing which have growing clusters within the city (Invest in Brazil). This metropolitan area has an unparalleled potential to become a major international center of culture, innovation, commerce and transportation.

## Challenges

The original plat of the city was modeled in a format very similar to the United States capital, Washington D.C. with a perpendicular and diagonal grid with streets named after Brazilian states, indigenous tribes, former governors and presidents (Primidi). Outside of this original grid the city has grown in an erratic and haphazard manner, radiating out from this central area. The original city center has become a high-density, residential and business district. This heavily populated and transited area is located at the foothills of the Serra do Curral Del Rei mountain range. The high quantity of residential and office building in this central area of the city is strangling traffic corridors (Ayer & Oliveira). The combination of difficult terrain with antiquated and poorly planned street designs has resulted in extreme traffic congestion throughout the city. Apart from the gridlock is the problem of heightened travel times for emergency and non-emergency vehicles, high incidents of vehicular and pedestrian accidents as well as air and noise pollution at all hours. Residents of the metropolitan area lose tremendous amounts of time being stuck in traffic which in turn deteriorates mental and physical health as well as productivity.



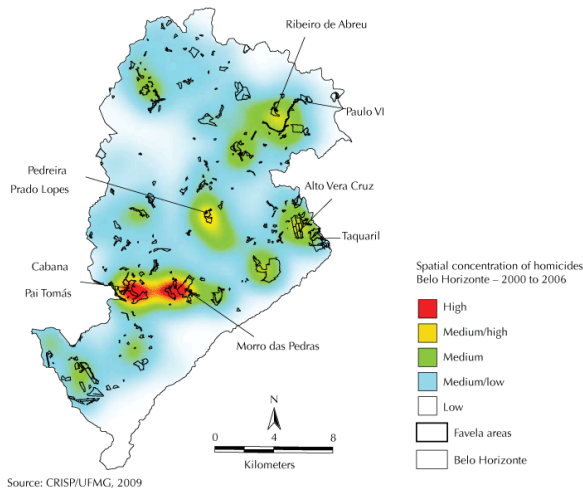
Figure 1-2 Original street layout of the City of Belo Horizonte bounded by Contorno Avenue. To the right is this avenue in the present day.



*Figure 3 Traffic in central area from where most major streets radiate. Figure 2 Typical traffic along Afonso Pena Avenue, Belo Horizonte's main downtown avenue.*

Brazil as a nation has suffered greatly from a financial crisis since 2014 due largely to the drop in commodity prices which had served as the main engine to Brazil's economy for all of its history. Also, Brazil's substandard infrastructure has increased production and transportation costs and has made the country comparatively unattractive to investment (The Economist). The poverty spiral created by these hardships has caused many clandestine settlements and slums to develop within the city and around the metropolitan area; especially in many hillside locations. These slums apart from being an eyesore, create unsanitary environments due to the lack of running water and open sewage. This is of particular concern especially with the recent outbreaks of the mosquito-born zika virus as well as dengue and chikungunya epidemics which have affected Brazil significantly (Miroff, Phillips). The favelas have also been havens for violence and crime which is able to function within the narrow, tangled and intransitable arteries and ramshackle constructions.





Source: CRISP/UFMG, 2009

Figure. Spatial concentration of homicides in the city of Belo Horizonte, Southeastern Brazil.



Figure 3-5 Map showing the frequency of homicides and locations of slums within the Belo Horizonte city limits. On the right is a typical Favela in the Aglomerado da Serra neighborhood in Belo Horizonte.



Figure 6-7 Apartments built through the Vila Viva program in the Taquaril slum on the hillsides of Eastern Belo Horizonte. On the right is police operations in the favelas.

The city administration and former mayor, Fernando Pimentel, pioneered a solution to these issues posed by these most impoverished areas of the city. The Vila Viva program replaced the slums with apartments for the residents and provided city services such as water, sewers, electricity, paved streets, garbage collection and police protection (Prefeitura de Belo Horizonte). Despite this noble and innovative initiative taking place in Belo Horizonte, the vast majority of slum dwellers within the city and greater metropolitan area still live in the same conditions they did before they program was launched (Brasil247).

## Traffic, Crime & Employment Data

Between 2013 and 2014 there were 352 vehicle related deaths in Belo Horizonte; 337 of them occurring on the *Anel Rodoviario* ring-road highway which handles practically all regional and interstate traffic in the metropolitan area. This accounts for 21% of all in the traffic fatalities in entire state of Minas Gerais. The remainder of those killed in traffic accidents in Belo Horizonte occurred on major thoroughfares emanating from Belo Horizonte's congested downtown such as Contorno Avenue (Estado de Minas). In 2014 for every 1,000 residents there were 7.11 traffic related fatalities in the City of Belo Horizonte. During 2014 there were 177 traffic related deaths in the city albeit a decrease this rate is still considered unacceptable by the World Health Organization; (O Tempo). At this point in 2016 60% of traffic related injuries and hospitalizations are due to private motorcyclists speeding on the ring-road highway. Not only does this endanger the lives and health of innocent motorists, these accidents choke the flow of traffic on the main existing limited access highway of the entire region.

With vehicle ownership rising 149% within Brazil this is cause for major concern for public officials and urban planners. According to the Tomtom Traffic Index congestion levels in Belo Horizonte have remained the same at a 27% congestion level for the past year. It is presently ranked as the 6<sup>th</sup> most congested large city in the Brazil preceded by Rio de Janeiro, three other coastal metropolises and São Paulo which has four times the population of Belo Horizonte. Drivers in Belo Horizonte spend 29 minutes per day in traffic equaling 113 hours per being caught in gridlock. For comparison sake Dallas' travel times have decreased over the past year having a congestion level of 17% (Tomtom Traffic Index).

In February of 2016 the national unemployment rate for Brazil was 8.2%. At this time Belo Horizonte's was 7.2%, the fourth highest rate of major cities within Brazil. At the end of the first trimester of 2016 the national rate has increased to 10.9% with 11.1 million jobless people

(UOL Economia). In 2015 there was a 14.67% increase in robberies along with an 11% increase in violent crime in the Belo Horizonte metropolitan area. The area with the highest incidence of robberies is the old city center (Estado de Minas). Crime rates are 40.6% higher than last year in Belo Horizonte (Otempo).

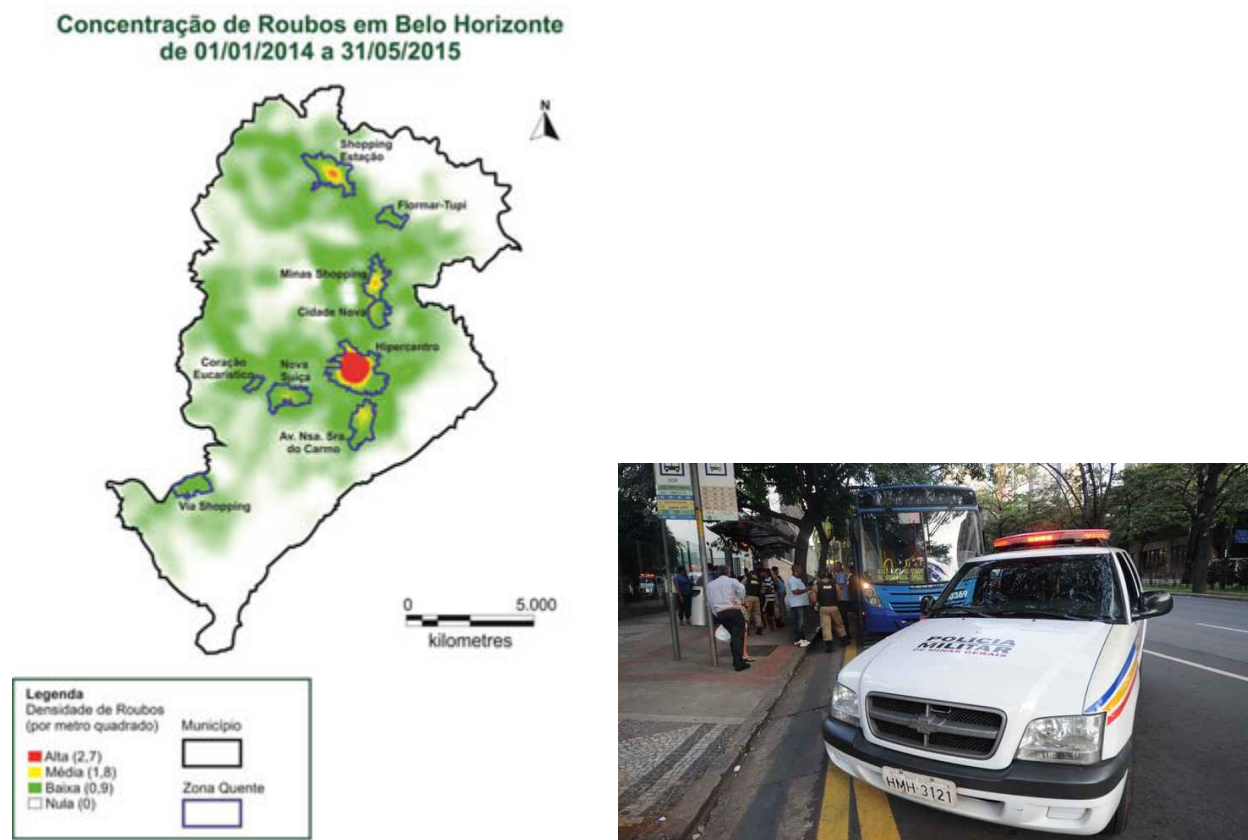


Figure 8-9 Concentration of robberies within Belo Horizonte between 1/1/2014 and 5/31/2015. The city center has the highest rate and is marked in red. Graphic & picture provided by Estado de Minas online newspaper.

## Analysis & Suggested Plans

### AEROTROPOLIS PLAN

Since the Belo Horizonte metropolitan area is a major inland center without navigable waterways, it is imperative that it develop and expand its airports and aviation infrastructure. The 2015 Regional Master Plan prepared by the Economic Development Department of the State of Minas Gerais makes this a central part of the plan. It even goes so far as creating the first Aerotropolis of South America based at Belo Horizonte's Tancredo Neves International Airport. The term Aerotropolis was coined by Dr. John D. Kasardra an air commerce and business

professor and consultant. The Aerotropolis is in essence an Airport City in which the airport functions as the central node of a metropolis (Kasarda). Corridors made up of aviation dependent businesses and aviation related businesses radiate from this central airport.

The Greater Dallas-Fort Worth region epitomizes the successes of a functioning Aerotropolis. This airport is jointly owned and managed by the Cities of Dallas and Fort Worth in cooperation and mutual benefit instead of competition. DFW International Airport has a \$37 billion dollar economic impact on the metropolitan area. The airport provides 228,000 jobs and is set to serve 70 million passengers annually. Each international flight into DFW Airport roughly translates into \$250 million dollars annually (Hethcock). Currently Belo Horizonte's Tancredo Neves International Airport only handled 7 million while congested São Paulo-Guarulhos International Airport handled roughly 39 million passengers, making it the busiest in Latin America (Infraero). Belo Horizonte can and should take the lion share of these transfer passengers that are using São Paulo's congested airports.

The 2015 Belo Horizonte masterplan borrows heavily from this brilliant concept and rightfully so. For an Aerotropolis to be successful the plan must be economically, socially and ecologically sustainable and it must correspond to the current market and skill sets of the local area. Also, there must be metropolitan consolidation and a cooperation between all government entities to make the Aerotropolis truly successful. Greater Belo Horizonte's Tancredo Neves International Airport is located 25 miles (40 kilometers) from downtown, roughly the same distance from Dallas Fort Worth International Airport and downtown Dallas. Dr. Kasardra notes that DFW Airport and the surrounding metropolitan area is a prime example of a successful Aerotropolis which has developed through long range regional planning and in an integrated manner between separate government bodies (Kasarda).



Figure 10 Google Map 3 dimensional view of Tancredo Neves International Airport form the north.

Tancredo Neves International Airport is located adjacent to an extremely ecologically delicate area. This area is the Lagoa Santa Karst Environmental Protection Area (*Área de Proteção Ambiental Carste de Lagoa Santa*); this area has many caverns, lakes, and sinkholes. Moreover, it is the location of the *Parque Estadual do Sumidouro* which is a state park with thirty-five caves and 4,000 year old pictographs as well as prehistoric fossils. It was in these caverns that Danish paleontologist Peter Wilhelm Lund discovered a 12,000 year old skull; the oldest human remains found in the western hemisphere (Neves & Hubbe). This location around Tancredo Neves Airport is designated as an unbuildable area and with the highest vulnerability for environmental impact. If this particular airport is expanded as currently planned, this extremely fragile ecological area will be in the direct flight path of the two new runways.



*Figure 11 Plan of expansion of Tancredo Neves International Airport proposed by Changi Airport Consultants which more than triples the size of the existing airport. The two additional eastern runways will have planes flying directly over the Environmental Protection Area and the ecologically fragile state park with the ancient caverns pictured below. Figure 12-13.*

The current expansion plans for the eastern half of Tancredo Neves Airport should be completely cancelled. One more terminal should be constructed as planned next to the existing terminal at the airport and when needed another runway shall be constructed at the southern end of the airport forming an L shape with the original runway west of the terminals. This airport would serve for cargo flights, and continue to be a location for aviation maintenance in a manner similar to Fort Worth's Alliance Airport. Tancredo Neves Airport would still serve Greater Belo Horizonte with domestic and charter flights as well as continue as a hub for Azul Airlines, the Brazilian subsidiary of Jet Blue Airlines. The current plan which calls for an aerospace and

defense cluster to be developed in the vicinity of this airport would continue to be feasible especially since Tancredo Neves Airport would not be so heavily burdened by traffic from commercial aviation (Estudo Master Plan)



Figure 14 Google Earth image of Tancredo Neves International Airport. To the north of the airfield circled in red are the ecologically fragile Karst Environmental Protection Area and the Sumidouro State Park. Highlighted in orange is the location for the 2<sup>nd</sup> terminal and proposed 2<sup>nd</sup> runway which would more easily serve planes approaching from the south and greatly lessen air traffic over the ecologically fragile locations northeast of the airport. (Google Earth Map Adapted by author)

This report recommends the construction of a new international airport hub to the southwest of Belo Horizonte in the industrial suburb of Betim, where there is a mostly uninhabited and amenable location to build this new airport with three runways and four passenger terminals

along with some cargo and aircraft maintenance facilities. This roughly twelve square mile (nineteen square kilometer) locale contains relatively flat land for this particular region and unlike the area surrounding the existing international airport has low physical vulnerability to environmental impacts (Estudo Master Plan). Airports are crucial to the success of a metropolitan area, especially for a major inland city without navigable waterways and in a geographically large nation without a quality interstate highway system. Belo Horizonte's nearly impeccable climate and abundant land make it an excellent location for a major such an aviation hub.



*Figure 15 Proposed location for the new Belo Horizonte International Airport. The land is relative flat and located in an uninhabited area with low environmental impacts and without building restrictions unlike the current location of Tancredo Neves International Airport. (Snipped from Google Earth)*

Currently, São Paulo-Guarulhos Airport is the main international gateway into Brazil as well as the busiest airport in the nation. However, this airport suffers from chronic congestion and frequent weather delays. Both of São Paulo's airports are completely surrounded by urban development and cannot expand. São Paulo's domestic Congonhas Airport, which is the third busiest in the country has had a dismal safety record with many deadly accidents in recent history, killing hundreds of passengers and residents of the densely populated neighborhoods



surrounding the airport due to its short runways and being surrounded by heavily populated neighborhoods (Sturcke). There is currently an expansion of Viracopos Airport in the neighboring midsized city of Campinas to serve as a major reliever airport. However, this airport is 62 miles away (100 kilometers) and at least 1 hour by car from most of Greater São Paulo. Both of Rio de Janeiro's airports are also unable to expand due to being surrounded by urban development and naturally bounded by Guanabara Bay.

The transportation and airport infrastructure of São Paulo is over exhausted and cannot continue to sustainably or efficiently function as a gateway and transportation hub for the nation as a whole. Belo Horizonte, unlike metropolitan Rio de Janeiro, has abundant land resources and a more favorable central location to become the new and premier portal into the fifth largest nation on Earth. The Aerotropolis, having a primary focus in the current regional master plan, is correct in recognizing the priority of such a major airport being the main catalyst for development in the Belo Horizonte metropolitan area. Apart from the massive undertaking of constructing this airport there must be direct coordination with the private sector in making sure that this investment is properly implemented to provide the greatest returns to citizens and business in the metropolitan area as a whole (Kasarda). There must be an urban council formed among the regions political and business leaders to create synergy in achieving these ambitious goals.

For instance, a newly created regional planning council should work with the airport authority – Infraero - to pull major airlines into this airport, especially airlines within global code-share alliances. Currently, TAM Airlines based out of São Paulo-Guarulhos International Airport is the only large-scale international airline of Brazil and a member of the Oneworld Alliance. A potential idea is for Star Alliance member Avianca Brasil airlines to rebrand itself as Varig Airlines which was a former Star Alliance member and historically Brazil's largest airline that served five continents in its heyday. The newly re-founded Varig Brazilian Airlines would be the main tenant of Belo Horizonte's new international airport in a similar way that American Airlines is the main

tenant at Dallas-Fort Worth International Airport. Varig Airlines would use the new international airport as its main hub and operating base.

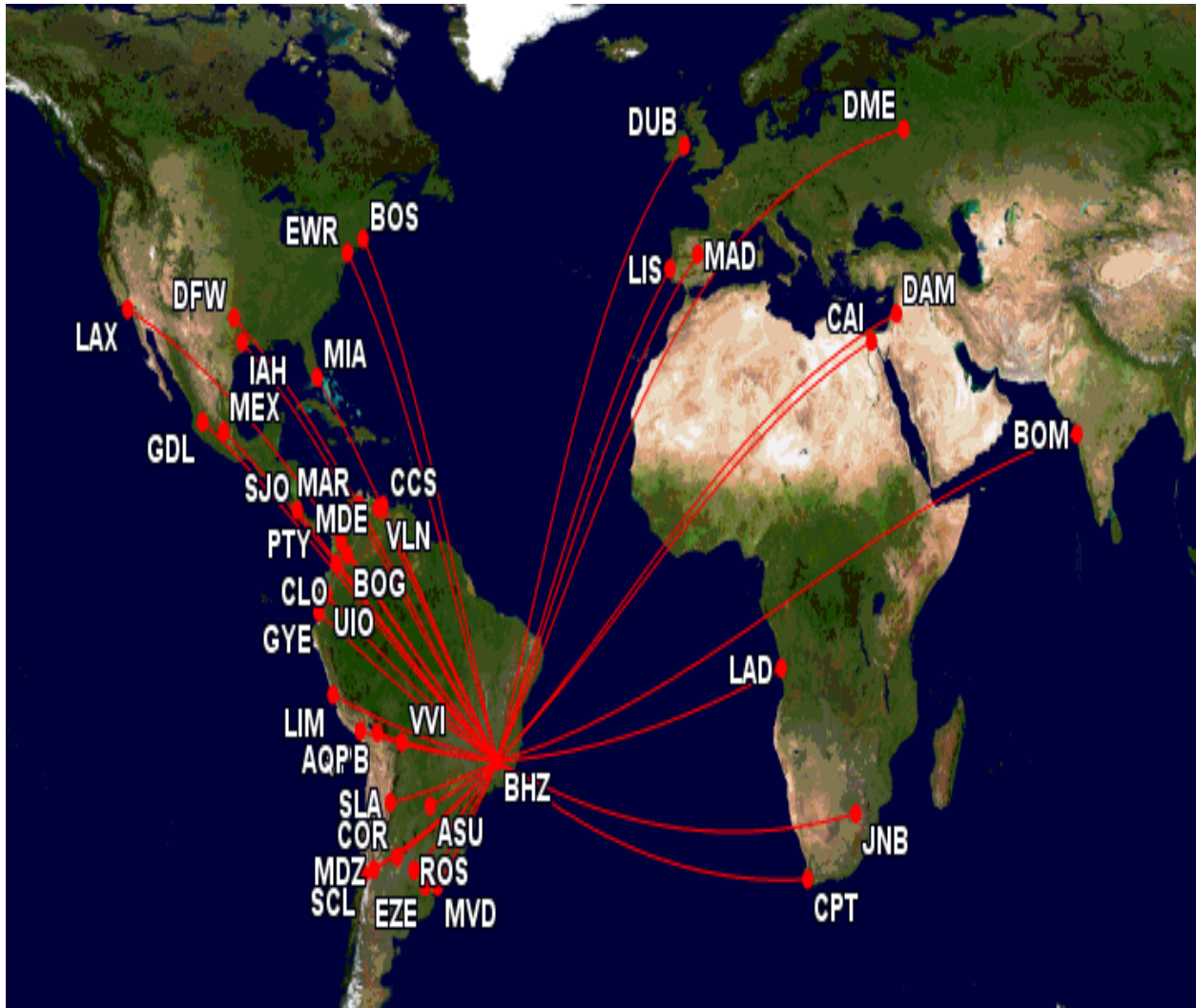


Figure 16 Map showing proposed direct international flights from Belo Horizonte's new International Airport.

The airline would serve and grow together with the metropolitan region as a whole. From Belo Horizonte carefully planned destination cities would be chosen, connecting Brazil and the South-Cone to Africa, Europe, the Middle East, the Indian Subcontinent and North America. Also, airlines not officially hubbed at Belo Horizonte's new international airport would still utilize the airport and be able to offer convenient connections to its passengers and ease traffic in the congested skies and airports of São Paulo. With millions of additional passengers passing through

this facility Belo Horizonte will receive greater international exposure. That said, the city will not only be a place to merely change planes, it will become a main destination for many of the passengers that pass through this airport.

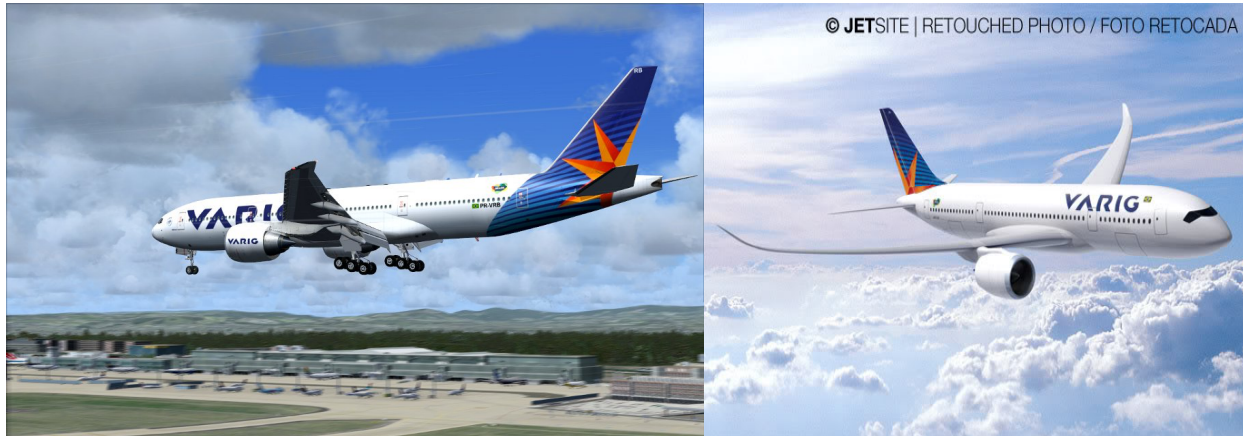


Figure 17-18 Rendering of VARIG Brazilian Airlines Boeing 777 and 787 jets. Jetsite Forums.

Below are examples as to why each of these particular intercontinental destinations were chosen to have direct flights to and from Belo Horizonte.

- a) Dublin: European gateway, Aer Lingus hub, high tech and banking industries, strong historic connections between Ireland and Latin America.
- b) Lisbon: TAP Air Portugal Star Alliance hub, Strong historical, linguistic and cultural connections between Minas Gerais & Portugal.
- c) Madrid: Iberia Airlines Oneworld Alliance hub, cultural and historical connections with Spain, 3<sup>rd</sup> largest city in Europe, financial center and major potential trade partner with Latin America.
- d) Moscow: Potentially large trade partner and emerging economy, first direct flight connecting Russia and South America.
- e) Damascus: Serving large Syrian, Lebanese and Palestinian communities of Brazil and South America. Potentially large trading partner, especially for Brazilian construction companies involved in the rebuilding of post-civil war Syria.

- f) Cairo: Egyptair Star Alliance hub. Gateway into the Middle East. Largest city in the Middle East.
- g) Luanda: Sister City, third largest Portuguese-speaking city in the world, cultural connections, gateway into Africa, emerging market.
- h) Cape Town and Johannesburg: Hubs for Star Alliance member South African Airways, emerging & growing markets, large historic Portuguese-speaking population.
- i) Mumbai: Financial, technological and entrepreneurial center of India. Historically large Portuguese influence. New Airport to be constructed, Gateway to India and Asia. First direct flight connecting the second and fifth largest nations on Earth.

To create these mutually beneficial trade partnerships and sustain these direct flights between Belo Horizonte and these major global centers, Greater Belo Horizonte must present itself seriously to the international community. Trade commissions would be established and the government of Minas Gerais would open offices in the cities with the new direct flights to Belo Horizonte. These offices would provide assistance to large and small companies as to how to navigate and succeed in selling their products in those particular foreign markets. Political, commercial and cultural leaders from Belo Horizonte would make visits to these particular cities. Cultural and educational exchanges would be done with these strategically chosen cities. From these connections business contacts will be formed and solidified. Strong trade, educational and cultural relationships fortifying links and strengthening the region's global reach.

#### COMMUNITY & ECONOMIC DEVELOPEMENT

A simple first step would be to create a strong, recognizable and memorable trademark for the State of Minas Gerais and the City of Belo Horizonte. The current state and city flags would receive a new look celebrating the regions rich history and culture. It would be a part of truly creating a brand and cultivating a theme for this emerging global metropolis. The embellished city and state flag would include traditional symbology from Brazil's prosperous imperial past and

Portuguese heraldry from the age of discovery; which was a precursor to modern globalization. The major cities of Buenos Aires and São Paulo both make use of traditional symbols in their classical flags. These colorful, improved flags would capture the essence of this rich, vibrant state and give the Mineiros a strong sense of pride in their history and culture.



Figure 19 New proposed flag for the Region of Belo Horizonte. The current coat of arms of the city is surrounded by the heraldic Portuguese cross of Avis in a manner similar to the flag of São Paulo which is surrounded by the Portuguese cross. (Flag designed by author)

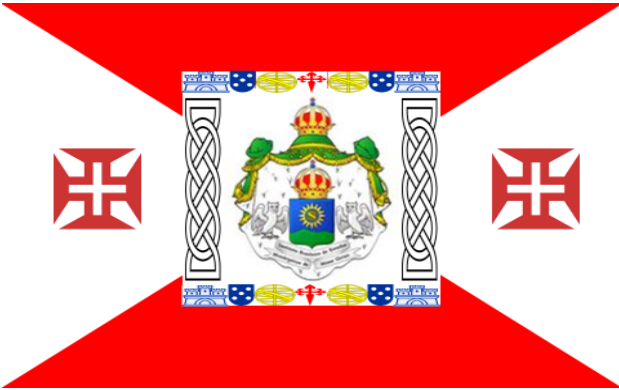


Figure 20 New proposed flag of the state of Minas borrowing upon the current colors of the existing flag however adding the imperial coat of arms of Minas Gerais. Also it borrows upon themes found in the flag of the Viceroyalty of Peru and the Portuguese symbol of the Order of the Cross found on the flag of Portugal's autonomous region of Madeira. (Flag designed by author)

Apart from these basic aesthetic changes and international outreach initiatives would be to promote businesses from Belo Horizonte and Minas Gerais to expand to foreign markets, especially for industries which have a competitive advantage within Minas Gerais. Such industries would include metal production and heavy manufacturing due to the regions vast mineral deposits. A transition from simply mining and natural resource extraction to production would

diversify the economy tremendously and expand a basic industry. The already present expertise in minerals and chemistry can be easily redirected into manufacturing in particular for heavy industries such as the manufacturing of tools and construction products as well as the assembly of computer hardware devices. Industrial design firms would also benefit from locating themselves in Belo Horizonte due to all of the related industries.

Industries related to construction products should be developed in the suburbs of Contagem and Betim which already have many manufacturing facilities and industrial parks. New industrial parks would also be developed along the beltways traversing this region. An example of a local manufacturing company which has now grown to become a large multinational firm is Supermix, a concrete company engaged in many large scale projects. From its humble beginnings in Belo Horizonte it now has operations in almost all of the states of Brazil and heavily in the Miami area in the United States (Supermix). Foreign industries such as Terex which manufactures construction, industrial, and material processing equipment has an assembly plant in the Belo Horizonte area along with Italian automobile manufacturer FIAT which has had a major assembly plant in the industrial suburb of Betim since 1976. This particular FIAT plant produces the highest number of vehicles of all FIAT factories around the world (Deliberato).

These major assembly plants can utilize the metals mined in the surrounding region to assemble those products. This is also a springboard for other automobile, tractor and heavy equipment manufactures to establish production facilities in and around Belo Horizonte, which have not yet significantly entered the Brazilian and South American market yet such as Cadillac, Nissan, Toyota, Navistar and John Deere. Not only will these industries provide gainful employment to thousands, they will also feed many supporting industries in the metropolitan area. With these industries there is a need for high tech and IT support. Three Dimensional printing could also be utilized in this proposed, industrial complex. With the updated network of freeways Belo Horizonte will become a premier center for product distribution within Brazil in a similar

manner in which the Dallas Fort-Worth area is a major logistics and distribution center for large and small businesses in the United States.

Retaining the current IT related industries located in Belo Horizonte is crucial in expanding this cluster. The already vibrant IT industry cluster can continue to grow and provide lucrative and highly skilled services to the region and the continent as a whole. An example of this would be webhosting services and data centers. Companies providing advanced technical services and consulting would also arise from these original industries. Another fitting sector for Belo Horizonte would be a financial cluster dealing especially in numismatics building upon the region's mineral wealth and the industry knowledge of metallurgy and minerology and the dealing in precious metals and stones. Also, this industry sector could assist Brazilian and international investors in leveraging against volatile capital markets.

The new international airport and the areas surrounding it in the suburb of Betim would be designated as a Free Trade Zone to aid local business to bolster their global reach as well inviting foreign businesses and investment into Belo Horizonte. Planned in the area around the airport would be warehouses, wholesale distributors, convention centers and flex space. Exported products which arrive in this free trade zone would not be charged duties and taxes until they leave the establishment in a manner similar to what is done at the Dallas Fort Worth International Airport. Many office mid-rise skyscrapers would also be located adjacent to the airport and outside of the direct flight paths. These office areas could serve as bases for companies launching their Brazilian and South American operations for their proximity to this airport hub gives these business easy access to vast Brazilian market. Tax incentives would be provided in particular for research and development firms, manufacturing facilities, mass media companies and film studios in these Free Trade Zones.

Global mass media firms such as CNN, Reuters, Russia Today, Grupo PRISA, and RTP (*Rádio e Televisão de Portugal*) would be potential tenants of this media cluster. These global

multi-lingual networks could establish networks serving the 215 million Portuguese speakers worldwide at this location. Alternatively, they can simply have their Brazilian and regional South American bureaus and affiliates established at this media center. Local broadcaster TV Alterosa could broaden its national and international reach from these studios providing news and entertainment. Other Brazilian networks such as Rede Bandeirantes, SBT and Rede Globo could also use this space. Film production and music recording studios would also be appropriate activities for this particular area.



Figure 21 Map of the proposed new international airport in the industrial suburb of Betim, Minas Gerais, Brazil. Surrounding the airport are the Foreign Trade Zones, warehouses, logistics space, hotels, mid-rise office buildings, Media and Studio Center. (Google Earth Map enhanced by author).

This proposed mass media center located just south of the new international airport will give Belo Horizonte major international exposure. From this the metropolitan government authority can promote domestic and international tourism to Belo Horizonte and the State of Minas



Gerais. A global advertising campaign should take place - especially in the cities - with the recently launched direct flights to and from Belo Horizonte. The historic cities on the outskirts of Belo Horizonte such as Sabará, Mariana, Congonhas and Ouro Preto which are UNESCO world heritage sites for their gold and silver plated baroque architecture, museums and art from Brazilian sculptor and architect Antônio Francisco Lisboa known as Aleijadinho during Brazil's gold rush during the colonial period. In the 1800s Ouro Preto was the largest city in Latin America and even had a population larger than New York City at the time (Lamim-Guedes). These cities especially Ouro Preto hold many traditional food, music, cultural and film festivals and even a large scale Carnival celebration. However, the road connections from Belo Horizonte to these cities is very poor.

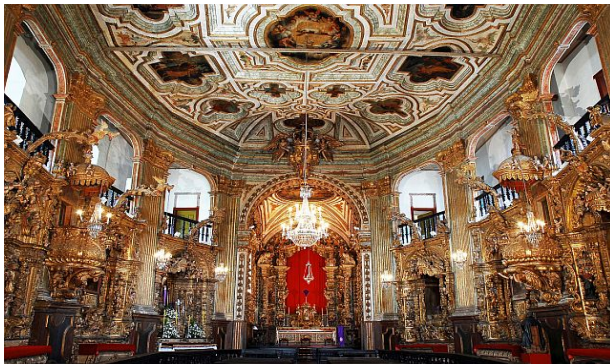


Figure 22-23 Historic city of Ouro Preto Minas, Gerais. Interior of São Francisco Church and panoramic view of this city located southeast of Belo Horizonte.

Belo Horizonte itself has many attractions such as its plazas, parks, churches and its markets offering a vast variety of local goods. A prime example is the city's downtown *Mercado Central* which sells a wide variety of fresh local food products, artwork and handcrafts native to region. Four more markets of this type should be opened across the metropolitan area to serve different regions of the city in a manner similar to Madrid and its urban gastronomical markets. The State of Minas Gerais is known across Brazil for its unique, rich and diverse cuisine. Belo

Horizonte is known for having a vibrant nightlife, restaurant and bar culture. Every Sunday there is also a large outdoor fair in the city center selling clothing, arts, crafts and food (Kugel).

There is an array of local food brands and small businesses in Minas Gerais that produce quality products. In particular Minas Gerais is the center for dairy production in Brazil and has exported these products to the nation as a whole such as Itambé which sells many milk products. In addition Minas is a major region for coffee cultivation. It is also home to many cachaça distilleries which is Brazil's most produced alcoholic beverage and the main ingredient in Brazil's national cocktail, the caipirinha. Culinary tourism is a major industry within Belo Horizonte and its surrounding areas.

Apart from the rich native cuisine of Minas Gerais, Belo Horizonte is also known for its exquisite establishments serving Italian, Portuguese, Lebanese and Chinese cuisines. Being a culinary center major international chefs and restaurateurs would benefit from opening restaurants in this metropolitan area. One basic and promising consideration is the idea that they can garner the unique cooking techniques and ingredients of this area. Also, this locale has skill and appreciation for the culinary arts and fine gastronomy. Notable international cuisines such as Basque, Greek, Armenian, Georgian, Persian, Indian, Ethiopian, Peruvian, Mexican, Korean, Vietnamese and Filipino can begin their entry into the Brazilian market through Belo Horizonte. This culinary cluster is also ideal for the development of fusion cuisines serving the tastes of longtime residents and cosmopolitan new comers.



Fonte: Ministério do Turismo



Figure 24-27 Belo Horizonte and Minas Gerais is widely regarded as the culinary heart of Brazil with its unique cuisine and multitude of local brands which are enjoyed nationally.

Food and beverage producers from Minas Gerais and the Belo Horizonte area in this economic development initiative will be encouraged and assisted in exporting their food products across the globe. Not only to the large Brazilian, Latin American and Iberian communities living abroad but also to global food connoisseurs and receptive foreign markets. The new airport will assist in the exportation of these products from this abundant region. Apart from exporting food

products, Belo Horizonte has an active fashion and design industry. Brazilian and Mineiro designers can use Belo Horizonte as a spring board to launch themselves to global markets. External designers would also launch their products to the Brazilian market from this metro area which has a refined market base. Jewelry design and production shall also become a prominent export industry once again because of the region's mineral wealth.

The new international airport should offer the sale of gold, silver and diamonds to passengers in transit duty free. Airport shops and restaurants would sell typical Brazilian chocolates, candies, cheeses and other food products from Minas Gerais. Moreover, within the new airport there would be cachaçaria cocktail lounges which also sell bottles of the native spirit along with liquors made from local and local tropical fruits such as the jaboticaba. Clothing, local souvenirs and merchandise of the city's three major soccer teams; América Futebol Clube, Atlético Mineiro and Cruzeiro Esporte Clube would also be available for purchase. All these amenities would give passengers a pleasant and memorable experience while passing through Belo Horizonte.



*Figure 28-29 Jaboticaba fruit and liqueur.*

Travelers would receive a favorable and authentic taste of the city. Also, within this elegant, state-of-the-art and masterfully-designed terminals would be a chapel offering travelers a place to peacefully reflect, meditate or pray before boarding flights. This chapel would be a small replica of the original, baroque chapel which initially existed during the city's founding and has now been replaced by a Gothic, Portuguese-style cathedral. That original chapel was named *Capela da Boa Viagem* which in Portuguese means Chapel of the Good Voyage. The reason why it was named as such was that pioneers and migrants stopped to pray for a safe journey through the mountain ranges to southern Brazil. From the beginning Belo Horizonte has been a transportation center due to its location which is a transition zone between the semiarid Brazilian Plateau and Brazil's mountainous, subtropical southern region.

#### METRO-MATRIX PLANNING METHOD

Madrid's 2016 regional plan formulated in 1996 creates an entire metropolitan plan beyond the city limits and formulates a long-range plan for the entire region. Historic development patterns are taken into account in the mapping and planning of the urban expansion. Within this planning strategy there must also be a delineation of the margins of the metropolis. Once these margins are studied and identified, growth patterns can be laid out in a grid design (Contin, Ortiz). In Madrid's case it was the Guadarrama Mountain Range to the northwest of the city and the tablelands of Castile to the southeast that created the metropolitan margins. The metropolitan matrix grid in this regional plan does not stand alone but rather arises from the natural environment (Contin, Ortiz).

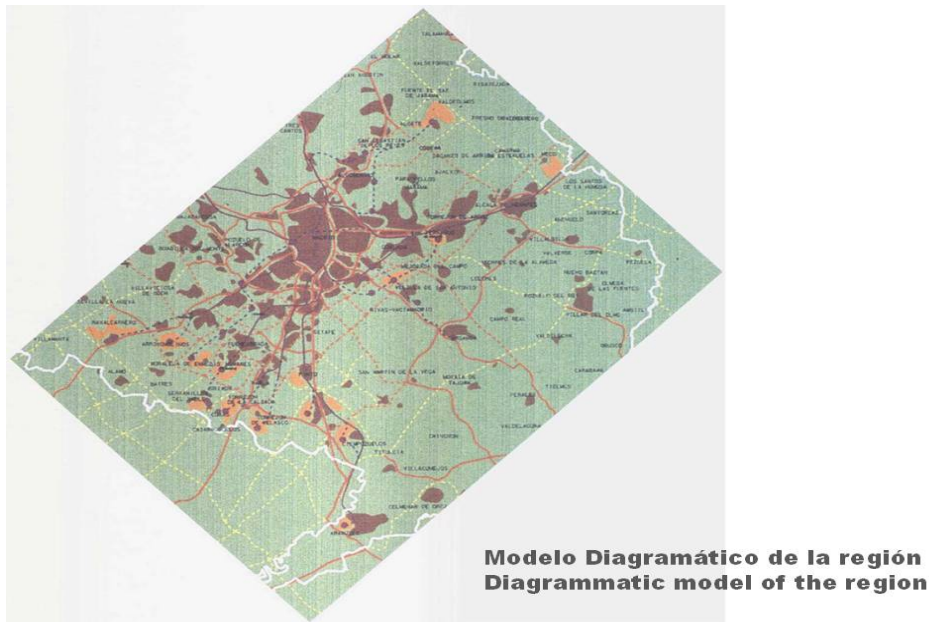


Figure 30 Diagram of the Madrid Metropolitan region which was the scope area for the 1996 Metro-Matrix Plan.

The Metropolitan Plan of Madrid “considers not only the inhabitants but also the city users.” This is of utmost importance to a major center of commerce and as a transportation hub. The city’s location is a reactivation of the ancient relational value of sites and places. The city’s past was related to its topographical situation. A railway, port or airport is a reanimation of the relational value of a particular site tying together the points of a territory (Contin, Ortiz). The Dallas Fort Worth area, for instance, is a river crossing and a transition zone between the wooded Deep South and the Great Plains.

Creating the abstract and concrete grid upon the metropolitan area, segments the metropolis into plots. The plots can be characterized by their local geographical situation. A value is related to its land function within the greater metropolitan area, creating a feeling of adequacy between the places and the people. The entrepreneurship of the scattered territory is enhanced and channeled due to the sensibility linked to the quality of each of the different territories. From this metropolitan-architecture project a true, integrated policy can arise encompassing economic investments, energy and cultural development (Contin, Ortiz).

Rather than globalization and mobility destroying the existence of places, it is actually a force in creating places through the linking of metropolitan systems. The metropolis is created due to its geographical position and history. This allows the metropolis to be at the center of a capital flow. From this movement and interaction of people and cultures, knowledge is produced. It becomes a center of human capital and a magnet for talents. The city is defined by its networks and relationships from a global scale to a local scale (Contin, Ortiz). This type of metro-matrix-metropolitan plan adapts to the new cultural spaces of the metropolis.

The nodes and districts within a metropolitan area are connected through different modes of transportation such as freeways, commuter rail, and bus to rapid transit systems. These adaptive modes of transportation are what create the urban fabric. Madrid's regional plan took into account both the green and grey infrastructure - the grey being transportation systems and the green being natural assets. This plan is built along the commuter rail lines and the freeway system of Madrid which follow the grid of the master plan (Contin, Ortiz). The intersecting of the green and grey infrastructures creates the geographic structure of the metropolis. Each location in the metropolis becomes a place of relation to the rest of the metropolitan area.

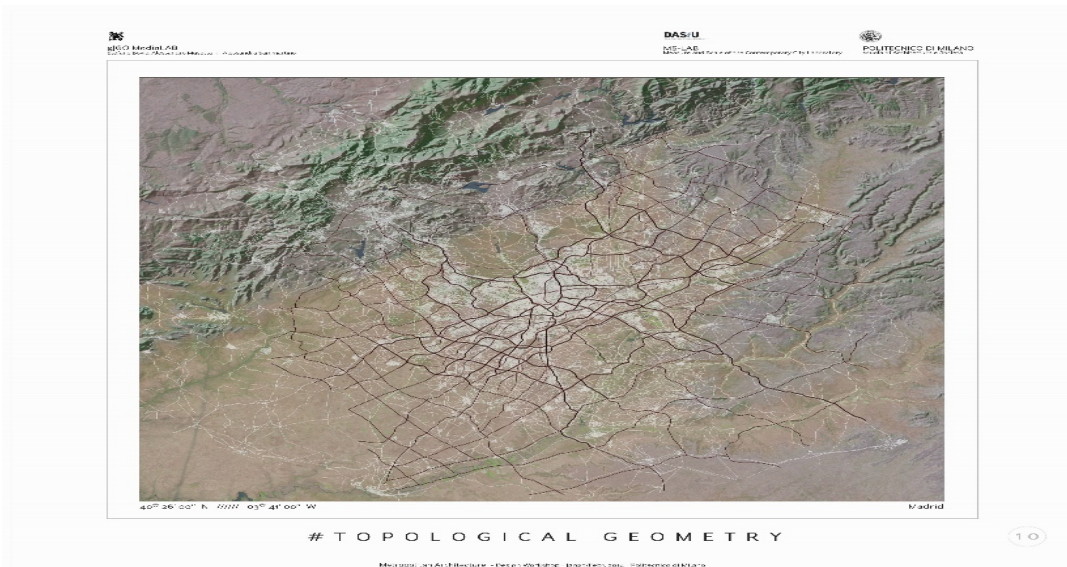


Figure 31 Metro Martix 1996 Madrid Regional Plan. Responding to the Guadarrama Mountain range to the northwest (top left) and the table lands of Castile to the southeast (bottom right). Pedro B Ortiz

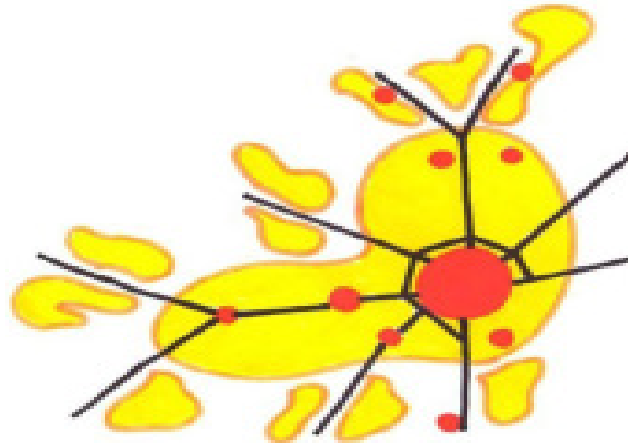
The new linear-reticular master plan doesn't develop from the ancient city center or continuing the historic city network. Rather, it looks at creating another system of connections with the backbone being the commuter rail lines and the freeways. The precise denial of the old city within the plan in actuality changes and reactivates the original city center. Old villages and towns within the expanded metropolitan area take on a symbolic role bridging the past within the new networks and realities (Contin, Ortiz). This reorienting of the metropolitan area to new realities and opportunities can be done through using the Metro-Matrix Planning method.

The status quo of planning for the Belo Horizonte metropolitan area over the past has been a been in the words of Pedro B. Ortiz, a "Do-nothing approach" which consists of instant urbanization due to the lack of economic and social capital which is characteristic of many cities in developing countries. Political short-term priorities neglect planning and creating an urban form. However, what results is an urban fabric with poor access to services and necessities (Ortiz). This can be found in the favelas as well as the leap-frog development in the exurban periphery of Belo Horizonte. When Belo Horizonte was founded, the city was planned in a baroque street grid.



Subsequently, the city has developed in a non-uniform structure in a manner which can be described as a sprawling bed of moss by the Metro-Matrix theory (Ortiz).

Figure 32-33 Existing monocentric metropolitan area which concentrates traffic through the congested city center. This is the status quo of instant poorly planned urbanization. Diagram and satellite image below.

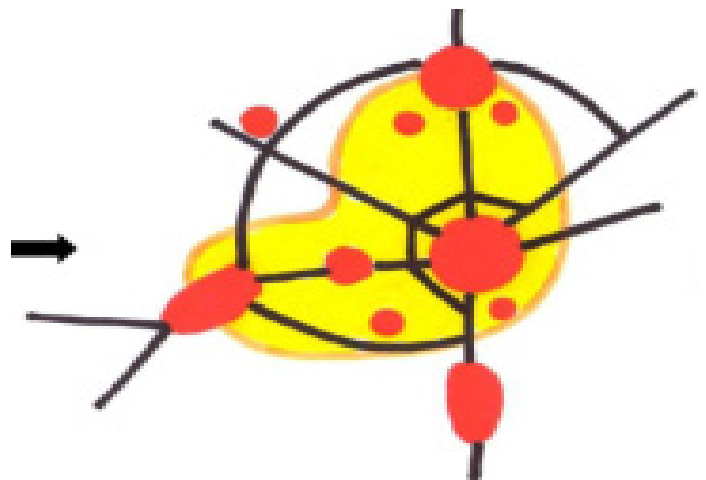


The World Bank and State Government Masterplan released in 2015 proposes a radial-orbital structure to the Belo Horizonte metropolitan area with nodes surrounding the city along a main ring-road. However, as the city grows beyond the limit threshold of this orbital structure, this metropolitan design becomes ineffective (Ortiz). Belo Horizonte already suffers significantly from this obsolete planning method. This trend of building a ring-road with edge cities and industrial

parks further out will only repeat the trend of continued dispersed urban development snarled by vehicular traffic. The original city plan was bounded by circular Contorno Avenue and then afterwards by the semicircular *Anel Rodoviario* ring-road highway.

Since then, urbanization has surged far beyond these orbital and semi-orbital roadways which have become surrounded by thick, urban development and chocked by automobile, truck and bus traffic. The heightened travel distances and future traffic snarls created by this dysfunctional model will continue to make this region uncompetitive (Ortiz). Lastly, the manner in which this new ring-road called *Contorno Metropolitano* in the 2015 regional plan is designed presents major, potential problems in the long run. It is designed as if Belo Horizonte is in a featureless plain and doesn't take into account the mountain ranges to the south and east of the metropolitan area. It only considers the existing and proposed points of interest and the nodes along this circular beltway.

Figure 34 Diagram of orbital polycentric metropolitan structure proposed by the 2015 World Bank & State of Minas Gerais Masterplan. (Image retrieved from Estudo Master Plan power point document)



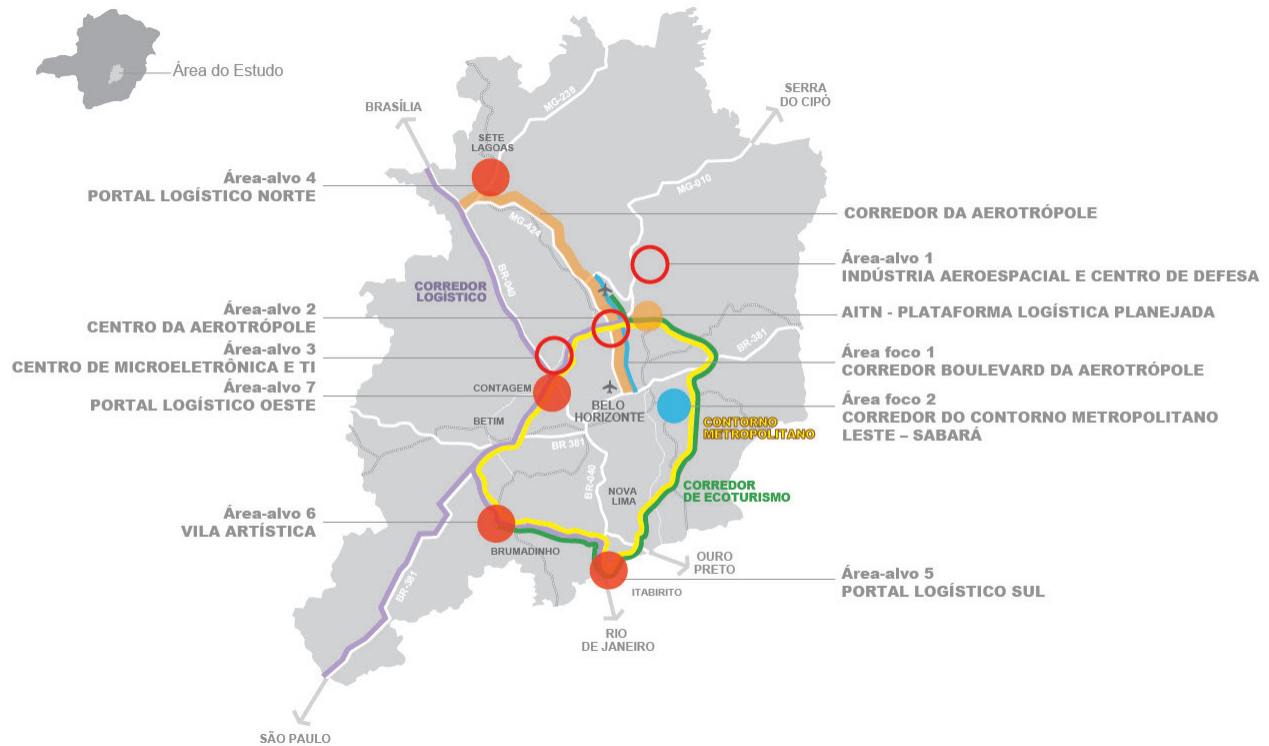


Figure 35 Map of the Contorno Metropolitano beltway and its nodes and industrial clusters surrounding the city.

## APPLICATION & DESIGN

What this plan proposes is similar to the 2015 World Bank and State of Minas Gerais masterplan in that it also calls for major investment in the regions airport infrastructure and promoting the creation of industrial and multiuse commercial clusters to be developed. It differs slightly in the locations where these developments would be constructed and in airport placement. The main difference between the two plans is in the form that this metropolitan area would be designed. Rather than constructing a circular beltway freeway around the city this project proposes more of a Metro-Matrix design for Greater Belo Horizonte. Just as the 1996 Madrid Metropolitan Plan was developed in a grid made of freeways and commuter rail lines. Instead of a circular Beltway freeway system, this report proposes a series of urban bypass expressways and freeway spurs forming a more grid like design over the greater Belo Horizonte with commuter

rail

lines.

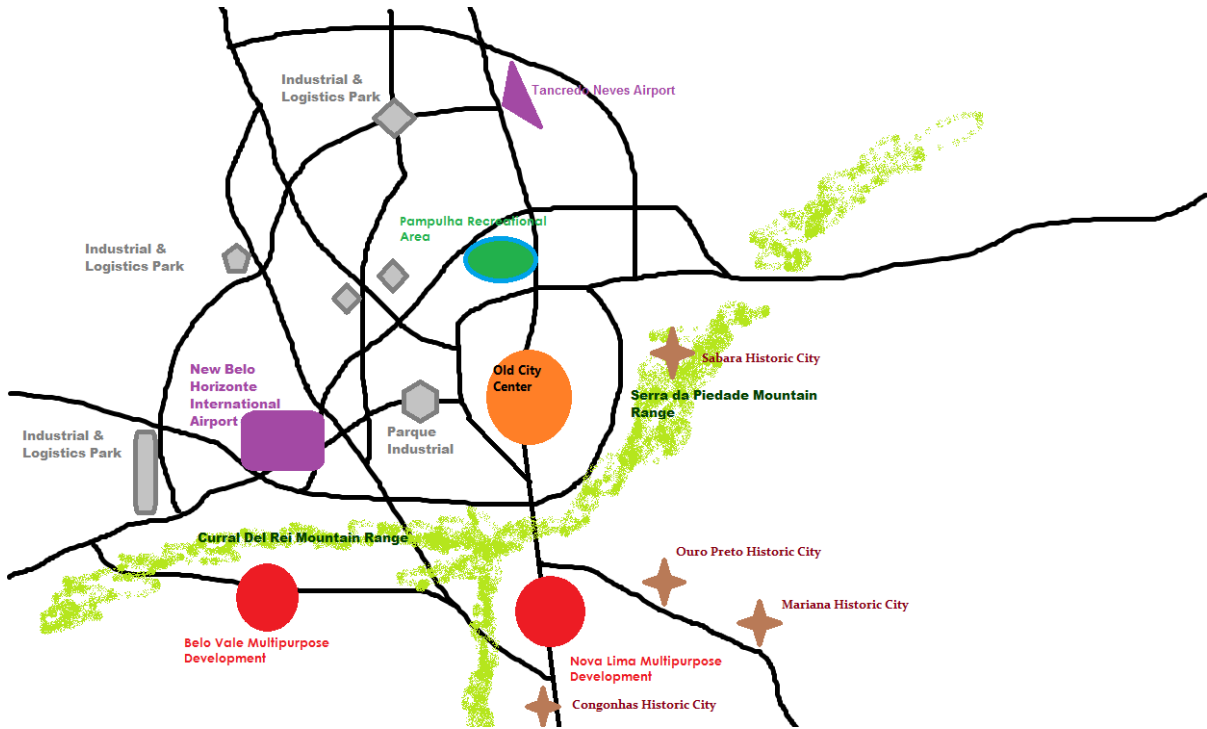
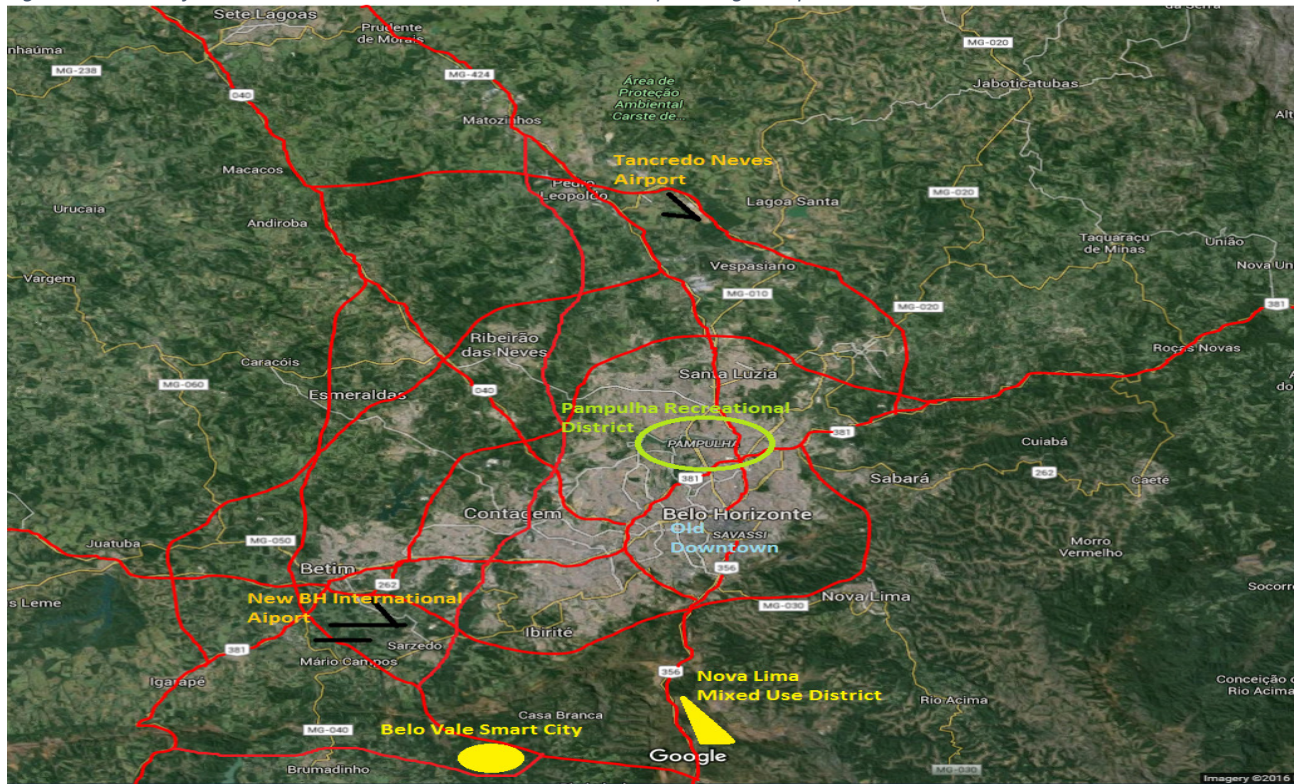


Figure 36 Sketch of Greater Belo Horizonte with a Metro-Matrix inspired regional plan.



*Figure 37 Proposed Freeway Network and principal developments in using the Metro-Matrix structure responding to the natural environment.*

This new plan would recognize the *Serra Curral Del Rei* mountain ranges as natural barriers as well as green infrastructure. Instead of continuing to allow the market and developers to build heavily at the foothills and along mountain ridges; which has had a disastrous effect on local traffic and caused major environmental degradation to this natural asset. The historical city center built in the baroque style grid will continue to function as a cultural center and as a multiuse district due to its concentrated nature and existing amenities such as historic museums, plazas and buildings. It is appropriate that it should continue as the bohemian location for the city's nightlife and arts scene. Downtown Belo Horizonte will be repurposed for these specific uses that it best fulfills. It would stand as a monument to the city's past and be a location for the arts, local shopping, leisure and residences in a dense urban environment geared more towards artists, young professionals and empty nesters.

Class A high-rise office space would be located in planned development districts in the suburbs of Nova Lima to the south and Belo Vale to the southwest of downtown Belo Horizonte. These multipurpose districts would offer some entertainment venues such as cinemas and performing arts centers, luxury shopping and hotels together with the office high-rises. Apartments and private residences would also be built in these planned developments. They would be constructed in locations which are currently undeveloped; thus requiring these new urbanizations to be constructed with the highest building and environmental sustainability standards. Being a tabula rasa these new neighborhoods can easily be equipped with all the modern amenities and provide a first world standard of living not customarily found in Brazil or South America. Examples of these amenities would be ubiquitous wireless internet, strong water pressure, subterranean powerlines and indoor climate control.



Figure 38-41. The new multipurpose developments would gracefully blend vanguard designs with timeless style. Inspiration is drawn from historical pictures of Belo Horizonte (top left, bottom right) and futuristic designs by architects Tuñón, Mansilla, Peralta (bottom left) and Hugh Ferriss (top right).

These new developments would appeal more to families, professionals and expats. These offices would be tailored for both large and midsized Brazilian and multinational companies as well as finance firms which were described in the community and economic development section. The current city center of Belo Horizonte cannot retain or attract these types of lucrative world class enterprises at a large scale. Belo Horizonte's existing downtown is so congested, dilapidated and plagued with security issues that it would not be time or cost-effective to attempt

to redevelop it in this manner with these types of projects that would attract the needed economic development for the metropolitan area. However, these modern districts in Nova Lima and Belo Vale would be connected to each other and to Belo Horizonte's historic downtown through the new freeway system and the parallel commuter rail lines. The new intercontinental airport hub and foreign trade zone would also be connected to these business, commercial and residential districts through the new freeways and commuter rail lines.

The Belo Vale and Nova Lima locations were chosen for these dynamic districts due to their accessibility to the new airport hub and the historic city center. Also easily accessible to these multipurpose locations are the world heritage historic cities of Congonhas, Ouro Preto, Mariana and Sabará which attract a multitude of visitors from far and near. Also proximately located in the southern area of is the Inhotim Institute which is a large open air contemporary art museum and botanical garden. These attractions would all be linked by the newly created freeway system. This southern region of the metropolitan area is best suited to being the commercial and touristic center of Greater Belo Horizonte. Apart from these attractions this portion of Greater Belo Horizonte is the most aesthetically enticing with its picturesque mountains and valleys.



Figure 42 A rendering of the mixed use high-rise commercial area in the Suburb of Nova Lima. Google Earth background with skyscrapers added by author.

The northern and western areas of this metropolis are more appropriate for being developed as industrial and logistical areas due to their flatter terrain and ease of transportation. Most of the interregional proposed ten lane freeways planned for the metro area transverse this section of Greater Belo Horizonte due to the lack of natural barriers such as the mountain ranges. Construction of factories, refineries, and intermodal railroad yards is more apropos in these locations especially in those encompassing freeway interchanges which are undesirable for housing and offices however favorable for industrial and distribution centers. The existing industrial parks are already located in the western and northern suburbs of Betim, Contagem and Sete Lagoas.



Figure 43 Current situation of Pampulha section of Belo Horizonte with small outdated domestic airport completely surrounded by development (Google Earth Satellite Image)



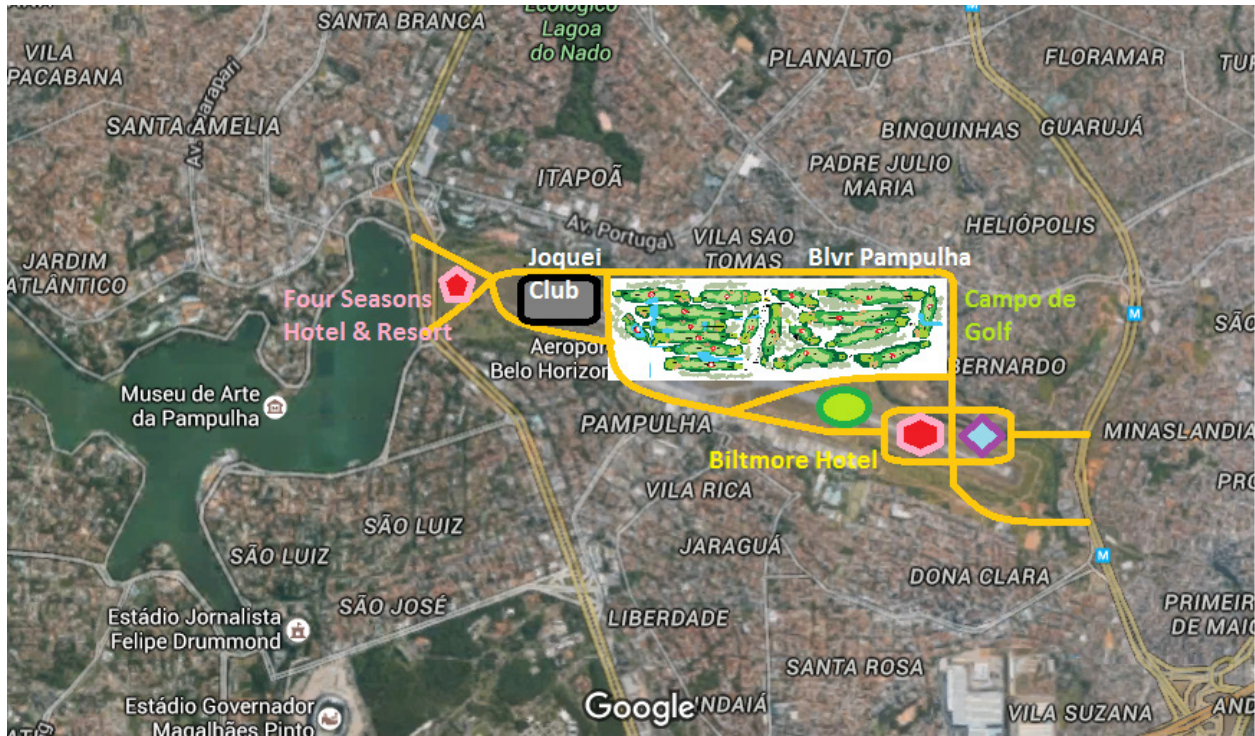


Figure 44 Proposed redevelopment of the Pampulha District of Belo Horizonte transforming the airfield into an area with recreation, gaming and hotels. (Google Earth Satellite image modified by author)

In the northern section of Belo Horizonte is the Pampulha District, it is a modern architectonic complex surrounding a large manmade lake. It was designed by architect and urbanists Oscar Niemeyer and Burle Marx who were principal designers and planners of Brazil's capital city Brasilia in the 1950s. This area is home to the Mineirão Soccer Stadium, Mineirinho Arena, Zoological Gardens and the Federal University of Minas Gerais. Also located in this section of the city is the small outdated Pampulha National Airport which is completely surrounded by urban development. This regional plan proposes closing this airport and shifting its few domestic and regional flights to nearby Tancredo Neves Airport. The site of Pampulha Airport would be transformed into a cluster of recreational activities building upon the already existing focus on sports and recreation found within this particular area. Golf courses, horse-racing, equestrian events, rodeos, tauromachy, jai-alai, and walking paths would all be potential uses for this

particular area. An adjoining hotel such as a Biltmore or Four Seasons resort would also be an appropriate addition to this location.



*Figure 45-48 Golfing and a luxury hotel and resort would be excellent uses for Belo Horizonte's Pampulha District (top right & left). Figure 40 Jai Alai would also be an appropriate recreational activity in this district of the city. Figure 41 Pampulha architectonic complex, São Francisco de Assis Church designed by Oscar Niemeyer.*

## Implementation

### Phasing

The new Intercontinental Airport hub and Foreign Trade Zone would be the first project to be constructed. The four terminals would be constructed all at the same time along with the three runways. The road network and existing highways leading to this project area would need to be expanded and improved incrementally as budgets allow. Also, the commuter rail line going

to the airport and to the new multiuse districts would begin construction while the terminals have reached completion. The foreign trade zones with hotels, offices, warehouses, show rooms and convention space would begin construction as soon as the private investors decide to break ground; the same would be true for the media and broadcast studio centers.

The next phase of this metropolitan transformation would be the construction of the modern multipurpose districts in Nova Lima and Belo Vale. Private developers along with the Metropolitan Government would begin these projects to intelligently accommodate the influx of new residents and businesses. These locales will be the primary real estate magnets and flagship developments for this region. They will contain the highest design standards providing density along with elegance and comfort. In addition they will be linked to the New International Airport, the original downtown and each other through the new freeway system and commuter rail system. These projects will allow Belo Horizonte to compete at an international level and shall bring an expanded tax base and external investment.

From this the existing urbanized areas and current downtown can be improved to match the quality of life in these new prototype developments as much as feasibly possible. Examples of this could be putting utilities underground, maintaining streets, repairing sewer lines, improving signage and updating street and traffic lights. Then, the Pampulha redevelopment can begin to materialize and capture more visitors and solidify Belo Horizonte as a premier tourist and recreational destination. Lastly, from transportation counts and observable demands the planned highways and commuter rail projects would reach completion, thus bringing this project to an end and completely revitalizing this metropolitan area through forward-thinking planning.

### Political Climate

The original Master Plan was produced by the Department of Economic Development of the State of Minas Gerais for the greater Belo Horizonte Metropolitan region which is made up

of twenty-seven municipalities (Estudo Master Plan). According to Brazilian constitutional law, the city council and the mayor have many powers. In Belo Horizonte's specific case the mayor has executive power and appoints secretaries to the nine administrative districts of the city. Also, under the mayor's office are municipal corporations which serve specific functions. Belotur and BHTRANS are two of the corporations; one specializing in tourism-related activities and the other maintaining and managing the city's public transportation systems.

Legislative decisions are made by the *câmara municipal* or municipal chamber which is made up of forty-one elected alderman. Currently, the mayor of Belo Horizonte is Marcio Lacerda of the (PSB) Brazilian Socialist Party, previously it was Fernando Pimentel (PT) of the Brazilian Workers Party. He is now the Governor of Minas Gerais. Two of Belo Horizonte's mayors have gone on to become presidents of Brazil, one of them being Juscelino Kubitschek, who realized the construction of the new capital, Brasilia, during his tenure in the 1950s. Despite political change, well conceptualized urban plans should be realized no matter who is politically in power. This plan should be introduced to the current mayor and all political leaders in Belo Horizonte no matter their party affiliation. Belo Horizonte, being the state capital and the center of the State of Minas Gerais, is also politically and economically significant in that state senators such as the nationally popular Aécio Neves of the Brazilian Social Democracy Party (PSDB) also support this plan.

This metropolitan master plan attempts to transcend political differences and aims to achieve universal benefits for the citizens of this region. This plan should continue to progress no matter the results of any election. The political nature of a plan might prevent its full implementation, but some plans can be so well devised that opposition will be minimal. For instance, the current political and economic climate in Brazil is ripe for radical change and is receptive to new ideas, even if they are not a formal part of the ruling Workers Party platform because they are sound and appealing. Presently, the large scale government protests across

the entire nation of Brazil for the past three years and the current impeachment proceedings for sitting President Dilma Rousseff are indicative of this. The source of indignation is twofold; one being the embezzlement carried out by business and political leaders at the highest levels. The other is that Brazilians are disaffected with the nation's economic instability, substandard infrastructure and deficient public services. This carefully devised metropolitan plan seeks to channel and multiply the wealth and energy of this young nation into a metropolitan area of great tactical importance.

### Financing

The RMBH – *Região Metropolitana de Belo Horizonte* was established in 1973 along with many other major Brazilian metropolitan areas with the purpose for metropolitan planning and management. In 2009 the RMBH Agency was created and it developed the Plan of Integrated Development or the PDDI (*Plano Diretor de Desenvolvimento Integrado*) which deals strictly with urban planning. Also developed by the RMBH agency is the Fund for Metropolitan Management (*Fundo de Desenvolvimento Metropolitano*) which directly is involved in finance. This agency functions in a manner similar to the council of governments by coordinating with professionals, creating an integrated, regional master plan, and managing the entire process. This organization works directly with non-governmental organizations such as the *Instituto Polis* and the *Fundação Israel Pinheiro* which assist it in conducting the plan's formulation in a participative process. This organization seems to be very much in flux and their plans seem to be very much a work-in-progress as they are involved in constant study of the changes occurring in this metropolitan area. This plan should be presented to this influential group which is heavily involved in all aspects of planning in Greater Belo Horizonte.

Bonds can be issued by the Brazilian Government to fund these projects both nationally and internationally. A weak economic situation and a devalued currency is actually viewed as an impetus for investors to purchase Brazilian government bonds for the long term with the

potentially higher bond yields and capital gains (Rapoza). The Organization of American States of which Brazil is a member can receive support to strengthen its micro, small and medium enterprises by assisting entrepreneurs in formulating business plans and financing strategies (OAS). Tax Increment Financing could encompass the new development zones and the anticipated revenue could be put back into improving the older neighborhoods of Belo Horizonte and into funding the BHTRANS agency and regional transportation authority in expanding metro and commuter rail lines. The Metro Matrix inspired highway system can be funded at least partially by tolls. This is needed in that concrete costs BRL\$9 (USD 2.59) per square meter (Palmer). The hotels and entertainment venues can have an added tax to raise funds for these specific projects.

The regional masterplan created in 2015 by the Economic Development Department of the State of Minas Gerais was funded by the World Bank. The World Bank disbursed a loan of \$1,435,560,000 to the State of Minas Gerais for The Second Minas Gerais Development Partnership Project. From this \$1,430,600 was disbursed specifically for the Economic Master Plan which aimed to serve as a guide for the Metropolitan Region of Belo Horizonte for the next twenty years. The plan is a comprehensive strategy for economic and regional development, gaging the social and economic needs. This initial plan sought to integrate state and local municipalities in creating economically and socially sustainable development while improving the State's ability to attract foreign investment (World Bank). Since this original World Bank funded Masterplan has already done much of the reconnaissance work, this improved plan could be done at a fraction of the expense.

### Private Sector Involvement

To further create competitive advantages and to attract businesses into Greater Belo Horizonte the Free Trade Zone surrounding the new international airport should be established by law. Tax exemptions for exported goods and imported goods would be created. This would

be modeled after the Free Economic Zone of Manaus, Brazil in the Northern Amazon region (SUFRAMA). A good strategy to attracting companies such as high tech firms and car manufactures to this region would be to capitalize on successful companies which are already located in the area. For example it can be arranged for potential tech firms to meet with leaders at Belo Horizonte's main Latin American Google office. Or for potential automobile manufactures to rendezvous with directors of the FIAT factory in the industrial suburb of Betim.

The abundance of iron ore and other heavy metals mined around Belo Horizonte along with the proximity of metallurgical processing factories would lower total construction costs. As a tax incentive companies such as European multinational ArcelorMittal and Brazilian steel producer Gerdau could provide construction materials and in turn receive tax breaks. Major Brazilian construction firms such as Odebrecht and Mendes Junior could be rewarded with office space if they participate in the construction of the new airport and free trade zones. They would receive in recompense state of the art offices conveniently located adjacent to the new international airport paying little or no rent nor sales tax for a period of decades. Local brand Supermix Concrete could also greatly benefit from these tax abatement initiatives if they provide there needed product for this investment. These strategies would attract and retain businesses as well as greatly lower construction costs for the main economic generator of Metropolitan Belo Horizonte.

Apart from attracting national companies this project also aims to bring in international firms offering external expertise to Brazil. Such a company would be Spanish multinational Ferrovial which operates infrastructure and municipal services. Avianca Airlines which could be rebranded as Varig Brazilian Airlines and establish a hub at the New International Airport should also be a partner in this public and private sector endeavor. Having this airline hubbed in Belo Horizonte could be mutually and mightily beneficial for both the greater metropolitan area and the airline. Also part of the Airport Free Trade Zone would be the Media and Studio Center

which would give national and international broadcasting companies no employee and corporate taxes for 50 years as well as low import taxes. These incentives would benefit these media and advertising companies and in turn they would give Belo Horizonte international exposure; making it the regional media hub and expanding its cultural imprint.

### Further Study

The University of Texas at Arlington's College of Architecture, Planning, and Public Administration could aid in this master plan effort. It would be mutually beneficial in that it will expand and embellish the program by creating an international division to it. A specifically designed studio or course could use the Belo Horizonte metropolitan area as a lab to investigate specific, urban issues and provide additional, creative solutions which have not yet been considered. It would offer students in these programs a unique study abroad opportunity to learn about Brazilian culture and the Portuguese language. Primarily though, it would give students an experience to work in a developing county and to challenge their skills as planners and public administrators.

Tasks such as data gathering and analysis would aid government planners and government agencies. Also, technically prognosticating the financial viability of different plans would be a pedagogical endeavor. Students in the Business, History, Portuguese and Latin American Studies Departments could also become involved in this international opportunity. This could potentially lead to more partnerships and synergy between University of Texas at Arlington and the Federal University of Minas Gerais across many different programs. Other synergistic opportunities would be between the small, private University of Dallas in Irving, Texas and Belo Horizonte's Pontifical Catholic University of Minas Gerais-PUC. All of these opportunities should be explored in detail and outreach should be made between these educational institutions.



## Coalition Building & Intergovernmental Relations

For a twenty to fifty year Metropolitan Plan of this magnitude the public needs to be properly informed about its details and the goals. It is imperative that journalists, writers, and political commentators give it excellent and accurate publicity to garner the public's support. This document should be translated into Portuguese and circulated among leaders and thinkers of the community. Local and renowned international architects should work on the multiuse projects together combining advanced building techniques with local knowledge. A strong link should be established with CREA Minas Gerais which is the board of certified architects, agronomists, engineers, geographers and geologist. Accountants and public finance experts would calculate and formulate exact, monetary breakdowns of how to allocate the needed funds for the projects. Ultimately, land use and tax attorneys are needed in this coalition to navigate Brazil's complex legal environment.

Comprehension and mutual understanding of the greater good of all of Metropolitan Belo Horizonte should be agreed upon by all of the twenty-seven municipalities. They should accept their specific role within the greater metropolitan area and should exploit each of their distinct characteristics in cooperation, rather than competition within this broad Metropolitan Plan. The State of Minas Gerais must continue to recognize Belo Horizonte as the axis point and economic engine for the entire state due to its size and location. For international government relations Belo Horizonte should share this plan with the foreign consulates and trade missions located in the city so that they can plan accordingly and promote Belo Horizonte as a location for investment. Also, to promote trade and travel the city and metro area must visit its sister cities with more frequency to maintain contacts and stimulate mutually beneficial trade especially utilizing the new international flights.

One of Belo Horizonte's sister cities is Newark, New Jersey which has many logistical, manufacturing and financial firms. In addition the city has large Brazilian and Portuguese

communities with abundant and active commercial and social service associations. This would be a vibrant partnership which would build many jobs and opportunities for their respective citizens. Another potentially fruitful international relationship is the Organization of Ibero-American States which promotes intergovernmental relations between Spain, Portugal and their former overseas dominions especially in the Western Hemisphere. Belo Horizonte, one of its suburbs or surrounding historic cities could host the yearly Ibero-American Summit which unites heads of state of all the member nations. Each of the conferences have a theme regarding a current serious issue affecting the member nations and after the deliberations ends with a declaration and solutions to the main issue. This Ibero-American Summit in Belo Horizonte could have the theme of Urban and Regional Planning and Transportation and how to improve them in these countries and set a model for the rest of the world.

## Conclusion

Currently, the City of Belo Horizonte is almost completely built up and there is very little room for additional development within the city limits. These new, innovative developments surrounding the city and its inner suburbs put forth in this proposal aim to strengthen and broaden the tax base. The proposed international airport and its adjoining developments will infuse this region with external investment and give local companies access to global markets. The integrated management approach for the Belo Horizonte area will in turn reinvest this prosperity into the original city center and surrounding areas which need it the most, especially for slum removal and housing initiatives.

Belo Horizonte, Minas Gerais, Brazil is a city with a hardworking, talented and energetic populace. The State of Minas Gerais has a noble past and a potentially bright and prosperous future, led by its capital region and largest metropolitan area. The people of Belo Horizonte deserve a comprehensive and forward-thinking urbanism that fosters economic health, is receptive to investment and intelligently channels traffic flows and urban growth. It is deplorable

that the citizens of this naturally blessed area with a rich culture are struggling with so many urban challenges which can be solved through the creative and innovative urban and regional planning solutions described and explored within this report. If realized, this plan will offer upward mobility and an improved quality of life for the citizens of Greater Belo Horizonte and will set a paradigm for all of Brazil.

A comprehensive, metropolitan-wide masterplan is necessary in developing this region to its fullest physical, economic, and social potential. The challenges that Belo Horizonte faces - primarily in the recent climate of economic stagnation, crime and traffic issues - can be solved by adopting many of the enterprising and innovative ideas suggested in this assessment by forward-thinking planners in Dallas-Fort Worth and Madrid. This is not a cut-and-paste strategy for Belo Horizonte, but rather a process of generating plans based on the uniqueness and strengths of this greater, metropolitan area. This plan responds to Belo Horizonte's position globally, within the nation of Brazil and locally.

## Works Cited

IBGE Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics) accessed February 5, 2016 [ftp://ftp.ibge.gov.br/Estimativas\\_de\\_Populacao/Estimativas\\_2014/estimativa\\_dou\\_2014.pdf](ftp://ftp.ibge.gov.br/Estimativas_de_Populacao/Estimativas_2014/estimativa_dou_2014.pdf)

Weatherbase: Belo Horizonte, Minas Gerais Brazil. accessed February 5, 2016 <http://www.weatherbase.com/weather/weather.php3?s=78538>

Brazil Weekly City Briefs accessed February 10, 2016  
<http://brazil-weekly.com/city-briefs/belo-horizonte/>

Invest in Brazil – Invest in Belo Horizonte accessed February 12, 2016  
<http://investinbrazil.biz/city/belo-horizonte/invest-belo-horizonte>

Primidi: History of Belo Horizonte accessed February 12, 2016  
[http://www.primidi.com/belo\\_horizonte/history](http://www.primidi.com/belo_horizonte/history)

Ayer Flávia & Oliveira Junia. Estado de Minas Quase 100 mil veículos a mais em BH. Accessed April 12th, 2016 [http://www.em.com.br/app/noticia/gerais/2012/01/20/interna\\_gerais,273367/quase-100-mil-veiculos-a-mais-em-bh.shtml](http://www.em.com.br/app/noticia/gerais/2012/01/20/interna_gerais,273367/quase-100-mil-veiculos-a-mais-em-bh.shtml)

The Economist. Has Brazil blown it? September 28<sup>th</sup> 2013 accessed February 12<sup>th</sup>, 2016  
<http://www.economist.com/news/leaders/21586833-stagnant-economy-bloated-state-and-mass-protests-mean-dilma-rousseff-must-change-course-has>

Nick Miroff and Dom Phillips. How Brazil, the darling of the developing world, came undone. The Washington Post April 15, 2016 accessed April 15<sup>th</sup>, 2016  
[https://www.washingtonpost.com/world/the\\_americas/how-brazil-the-darling-of-the-developing-world-came-undone/2016/04/14/40ee9356-fab4-11e5-813a-90ab563f0dde\\_story.html?wpmm=1&wpisrc=nl\\_headlines](https://www.washingtonpost.com/world/the_americas/how-brazil-the-darling-of-the-developing-world-came-undone/2016/04/14/40ee9356-fab4-11e5-813a-90ab563f0dde_story.html?wpmm=1&wpisrc=nl_headlines)

Prefeitura de Belo Horizonte – Urbel. Vila Viva accessed February 12th, 2016  
<http://portalpbh.pbh.gov.br/pbh/ecp/comunidade.do?evento=portlet&app=urbel&tax=8178&pg=5580&taxp=0&>

Brasil 247: “Pimentel Promete Levar Vila Viva” July 13<sup>th</sup>, 20-14. Accessed April 30th 2016. <http://www.brasil247.com/pt/247/minas247/146573/Pimentel-promete-levar-Vila-Viva-para-todo-o-Estado-de-Minas.htm>

Estado de Minas: BH Registrou o Maior Numero de Acidentes Fatais no Estado entre 2013 e 2014. Accessed April 29th, 2016  
[http://www.em.com.br/app/noticia/gerais/2015/07/16/interna\\_gerais,669213/bh-registrou-o-maior-numero-de-acidentes-fatais-no-estado-entre-2013-e.shtml](http://www.em.com.br/app/noticia/gerais/2015/07/16/interna_gerais,669213/bh-registrou-o-maior-numero-de-acidentes-fatais-no-estado-entre-2013-e.shtml)

O Tempo : Mortes no Trânsito caem 61% March 3rd 2016. accessed May 3<sup>rd</sup> 2016  
<http://www.otempo.com.br/cidades/mortes-no-tr%C3%A2nsito-caem-61-1.1290996>

Tomtom Traffic Index 2015 Data Belo Horizonte, Brasil Accessed May 3<sup>rd</sup> 2016

[https://www.tomtom.com/en\\_us/trafficindex/city/BHO](https://www.tomtom.com/en_us/trafficindex/city/BHO)

UOL Economia Desemprego Bate 10.2% April 20<sup>th</sup>, 2016 Accessed April 22<sup>nd</sup>, 2016

<http://economia.uol.com.br/empregos-e-carreiras/noticias/redacao/2016/04/20/pnad-trimestre-ate-fevereiro.htm>

Estado de Minas: Hipercentro e a Região.. July 7th, 2015. Accessed April 17th, 2016

[http://www.em.com.br/app/noticia/gerais/2015/07/09/interna\\_gerais,666684/hipercentro-e-a-regiao-com-o-maior-indice-de-roubos-em-belo-horizonte.shtml](http://www.em.com.br/app/noticia/gerais/2015/07/09/interna_gerais,666684/hipercentro-e-a-regiao-com-o-maior-indice-de-roubos-em-belo-horizonte.shtml)

Kasarda, John. D: Airport World. A Tale of two Airports Accessed February 20<sup>th</sup>, 2016

[http://www.aerotropolis.com/files/TaleOfTwoAirports\\_AW2\\_2013.pdf](http://www.aerotropolis.com/files/TaleOfTwoAirports_AW2_2013.pdf)

Hethcock, Bill. Dallas Business. Journal DFW Airport Economic Impact. October 13, 2015 Accessed May 1<sup>st</sup>, 2016 <http://www.bizjournals.com/dallas/news/2015/10/13/dfw-airport-economic-impact-grows-to-37-billion.html>

Infraeo: Estatísticas 2014 GRU Airport Accessed May 6th,

2016 <http://www.gru.com.br/Content/Media/f8d266ad-5225-4698-bbef-1b4dae5abf6d.pdf>

Kasarda, John D: Airport World. Airport Cities: The Evolution April/May 2014 Accessed March 2<sup>nd</sup>, 2016.

[http://www.aerotropolis.com/files/AirportCities\\_TheEvolution.pdf](http://www.aerotropolis.com/files/AirportCities_TheEvolution.pdf)

Walter A Neves and Mark Hubbe. Cranial Morphology of early Americans. PNAS. October 28, 2015 accessed March 30<sup>th</sup> 2016. <http://www.pnas.org/content/102/51/18309.full>

Sturke James. The Guardian: Pilots Wary of Infamous Sao Paulo Runway. Accessed May 1<sup>st</sup>, 2016 <http://www.theguardian.com/world/2007/jul/18/brazil.jamessturcke>

Estudo Master Plan. Bagwell Claudia Accessed May 5<sup>th</sup>, 2016

<http://www.desenvolvimento.mg.gov.br/pt/parceiro/master-plan>

Supermix. About Us. History [http://www.supermix.com/?page\\_id=2#about](http://www.supermix.com/?page_id=2#about)

Deliberato, André. UOL Maior fábrica do mundo... Accessed April 20<sup>th</sup>,

2016 <http://carros.uol.com.br/noticias/redacao/2015/02/05/maior-fabrica-do-mundo-faz-um-carro-a-cada-10-s-conheca-o-top-10.htm>

Lamim-Guedes, Valdia. Universidade Nacional de Timor-Leste. Colher o Fruto Sem Plantar a Árvore. May 2012. Ciência Hoje. [file:///C:/Users/Daniel/Downloads/opinioa292%20\(4\).pdf](file:///C:/Users/Daniel/Downloads/opinioa292%20(4).pdf)

Kugel, Seth. New York Times. A Town Where All the World is a Bar. October 2007. Accessed May 1, 2016 [http://www.nytimes.com/2007/10/28/travel/28next.html?\\_r=0](http://www.nytimes.com/2007/10/28/travel/28next.html?_r=0)

Contin Antonella, Metro Matrix Intellectual Fundamentals. Accessed April 30th, 2016 <http://www.pedrobortiz.com/display-articles/listforcountry/id/153>

Ortiz, Pedro B. Archipelago versus Metro-Matrix. The Future of Metropolitan Planning? Accessed April 30<sup>th</sup>, 2016 <http://www.pedrobortiz.com/display-articles/listforcountry/id/172>

Plano Metropolitano Macrozoneamento RMBH. Accessed April 29<sup>th</sup> 2016 <http://www.rmbh.org.br/pt-br/content/rmbh>

Rapoza, Kenneth. Forbes March 21,2015. With Currency in Gutter And Bad News Galore, Brazil Bonds A Buy accessed May, 5<sup>th</sup> 2016 <http://www.forbes.com/sites/kenrapoza/2015/03/21/with-currency-in-gutter-and-bad-news-galore-brazil-bonds-a-buy/#476e08c94c1f>

Organization of American States. Institutional Strengthening. Accessed May 5<sup>th</sup>, 2016 <http://www.oas.org/en/sedi/desd/ted/institutional.asp>

Palmer G.D. A Diferença Entre Concreto e Asfalto em Preço Accessed May 5th, 2016 [http://www.ehow.com.br/diferenca-concreto-asfalto-preco-info\\_53466/](http://www.ehow.com.br/diferenca-concreto-asfalto-preco-info_53466/)

World Bank April 29, 2015 Implementation Completion and Results Report-Second Minas Gerais Development Partnership Project Accessed May 6<sup>th</sup> 2016 <http://documents.worldbank.org/curated/en/2015/05/24442995/brazil-second-minas-gerais-development-partnership-project#>

Suframa-Modelo da Zona Franca de Manaus. Accessed May 6th, 2016 [http://www.suframa.gov.br/zfm\\_o\\_que\\_e\\_o\\_projeto\\_zfm.cfm](http://www.suframa.gov.br/zfm_o_que_e_o_projeto_zfm.cfm)