ENVR 451

Final Report

Evolving Landscapes of Colón:

Land use change and the politics of development

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Table of Contents

1.0 EXECUTIVE SUMMARY 3

1.1 English Version 3

1.2 Resumen Ejecutivo 4

2.0 ACKNOWLEDGMENTS 6

3.1 Host Institution 7

3.1.a The Smithsonian Tropical Research Institute 7

3.1.b Punta Galeta Marine Laboratory 7

3.2 Contact Information 8

3.3 Number of equivalent full days spent on project 8

4.0 CONTEXT OF STUDY 9

4.1 Introduction 9

4.1.a The Issue Addressed 9

4.1.b Study Objectives 11

4.1.c Study Zone 12

4.2 Review of relevant legal texts 13

4.3 Ethical Considerations 15

5.0 LAND USE & COVER - Update and Analysis of Trends 17

5.1 Introduction 17

5.2 Methodology 17

5.3 Results 20

5.3.a A situation analysis 20

5.3.b Land Use / Land Cover Trends 21

5.4 Limitations 22

5.5 Discussion 23

6.0 DEVELOPMENT PROJECTS – Exploring the process of change 25

6.1 Introduction 25

6.2 Methodology 26

6.3 Results 29

6.3.a Project Type and Investment Size 29

6.3.b Investment Size and Prospector Origin 30

6.3.c Spatial Distribution of Development Projects 31

6.4 Limitations 32

6.5 Discussion 33

7.0 POLITICAL ANALYSIS – Understanding the drivers 35

7.1 Introduction 35

7.2 Methodology 36

7.3 Results 38

7.3.a Governmental hierarchies and land planning.....39

7.3.b Environmental governance and ANAM 41

7.4 Discussion 43

7.5 Limitations 44

7.6 Visions for the future – Conclusion of the political analysis 45

8.0 CONCLUSION 47

8.1 The Future of Colon: a Story of Diverging Scenarios.....47

8.2 Recommendations: long term monitoring 48

8.3 Authors' Final Conclusions 49

REFERENCES.....51

APPENDICES 55

Appendix I – Figures.....55

I.I – Maps 55

I.II – Charts 63

I.III – Diagrammatic representations 70

I.IV – Tables 73

Appendix II – Legal Texts 76

Appendix III – Template of Semi-Structured Interviews.....79

Appendix IV – Proof of completion of TCPS 2: CORE Course 83

Appendix V – Research Calendar 84

Appendix VI.....84

Puerto Verde 84

Plan de Ordenamiento Territorial del Distrito de Colon.....85

1.0 EXECUTIVE SUMMARY

1.1 English Version

Evolving Landscapes of Colon: Land use change and the politics of development
By Chloé Debyser & Frederic Hoffmann

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The Panama Canal's role in shaping the country's economic, social and physical landscapes is undeniable. Demand for infrastructure to cater for vessels using the waterway in port-cities such as Colon is high, and a driver of substantial pressure on natural environments. The Smithsonian Tropical Research Institute's Punta Galeta Research Station lies in Isla Galeta Protected Landscape, an expanse of mangroves North East of Colon. Infrastructural development can be devastating to this ecosystem, which provides vital environmental regulation services to Colon, and is host to monitoring projects of high academic value.

This study emerged as a response to serious worries regarding this matter expressed by the staff and researchers of Punta Galeta. Our study aims to equip the research station with the tools to better understand the threat they face and the scale of its impact, subsequently empowering them to educate others and advocate for change.

First, a region comprising all the land within a five kilometre radius of Isla Galeta was defined as the zone of interest. Formerly covered by mangrove and forest, this area currently hosts Colon's biggest development projects, and thus some of the biggest threats to Punta Galeta. Using GIS software and recent imagery, a map of land use and land cover for February 2014 was made. When compared with results from a study conducted in 2003, a marked increase in deforested area in the zone between 2001 and 2014 was identified.

Second, using environmental impact assessments from the *Autoridad Nacional del Ambiente* (ANAM), we compiled a database of development projects approved for our study area between 2010 and 2013. Including values for the investment, its origin, the types of projects as well as their location, this database was designed to add depth to the understanding of who is investing in what. For example, in the four years preceding the study, the highest value investments were in port development, whereas the most development was done in commercial construction. This information was mapped to give better visual understanding of the spatial repartition of these projects.

Finally, interviews were held with a panoply of stakeholders in order to create a robust understanding of the drivers and backdrop against which such development is occurring. This shed light on deep issues within the local and national political spheres. It was general consensus among interviewees that a lack of strong environmental governance in Panama was partially to blame for the rapid and heavy rate of deforestation and nature degradation occurring in Colon. Furthermore, the central government and absence of local power within Panamanian decision making was a coined as problematic in terms of solving these problems.

This report peruses the process which went into the creation of these maps, the database as well as the analysis of the political landscape. It offers a methodology which we strongly recommend be repeated on a quinquennial basis, in order to keep the tools up to date and keep Punta Galeta's side of the debate informed. In light of new proposals for mega-ports in the waters surrounding Isla Galeta, knowledge and understanding of the ever-evolving scenario are more important than ever before if sound environmental policy and planning are to be lobbied for.

1.2 Resumen Ejecutivo

Paisajes de Colón en Evolución: Cambios del Uso del Suelo y Políticas de Desarrollo
De Chloé Debyser y Frederic Hoffmann

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El papel del Canal de Panamá en la formación de los paisajes económicos, sociales, y físicas del país es innegable. La demanda de infraestructura para atender a los barcos que utilicen la vía acuática en ciudades portuarias como Colón está alta, y un elemento clave en la presión sobre el medioambiente. El Laboratorio Marino Punta Galeta, del Instituto Smithsonian de Investigaciones Tropicales, se encuentra en Isla Galeta, una extensión de manglares al noroeste de Colón. El desarrollo de infraestructuras puede ser devastador para este ecosistema que proporciona servicios de regulación ambientales vitales para Colón, y contiene proyectos de monitoreo de alta valor académica.

Este estudio surgió como una respuesta a las preocupaciones que estaban manifestados por el personal y los investigadores de Punta Galeta. Nuestro estudio tiene como objetivo de dotar la estación con herramientas para profundizar el entendimiento de la magnitud y alcance de las amenazas que enfrentan. Este les dará lo que necesitan para educar y crear conciencia sobre este sujeto.

Primero, una región que comprende toda la tierra dentro de un radio de cinco kilómetros de Isla Galeta fue definida como la zona de interés. Anteriormente cubierta por manglares y bosques, este área alberga actualmente los proyectos de desarrollo más grandes de Colón, y por lo tanto algunas de las mayores amenazas a Punta Galeta. Con el uso de programas de SIG y imaginería reciente, se hizo una mapa de uso y cobertura del suelo. Cuando se compara con los resultados de un estudio realizado en la zona entre 2001 y 2014, un crecimiento marcado de deforestación es evidente.

Segundamente, con datos que llegan de Estudios de Impactos Ambientales de la Autoridad Nacional del Ambiente (ANAM) construimos una base de datos de todos los proyectos que fueron aprobadas por ANAM entre los años 2010 y 2013. Este base de datos fue diseñado para añadir profundidad a la comprensión de lo que está invirtiendo en Colón, y incluye valores para la inversión, el origen, el tipo, y la ubicación de cada proyecto. Desde la base de datos podemos ver que en los cuatro años anteriores al estudio, las inversiones en valores más altas fueron en el desarrollo portuario, mientras que la mayoría de los proyectos están de construcción comercial.

Esta información fue mapeada para dar una mejor comprensión visual de la repartición espacial de estos proyectos.

Por final, hacíamos entrevistas con un grupo de gente de origen varias para tener una imagen completa de los influencadores y del ambiente a dentro de que el desarrollo se hace. Este danos indicaciones de faltas profundas en las esferas políticas al nivel local tanto como al nivel nacional. Estaba un acuerdo general con los con quien hicimos entrevistas que falta de gobernación ambiental fuerte en Panamá. Este está la razón porque un deforestación y destrucción del medioambiente tan rápido y irreversible en los afueras de Colón existe. Que es mas, el gobierno centralizada y el falta de representación local al nivel nacional estaba identificado como un obstáculo en lo que concierne buscar soluciones a estas problemas.

Este informe describe el proceso que seguimos en la creación de las mapas, la base de datos, y el analice del paisaje político. Este ofrece una metodología que recomendemos sea repetido cada cinco años, para asegurarse que los herramientas quedan de actualidad, y que la gente de Punta Galeta siempre puede acedar a los datos que necesitan. Por causa de las pospuestas de nuevos mega-proyectos en los afueras de Isla Galeta, entender el proceso bajo del escenario que cambia sin fin es mas importante hoy que en ningún otro momento en el pasado, especialmente si los intereses de Punta Galeta van a ser representados.

2.0 ACKNOWLEDGMENTS

We would like to express our deepest gratitude to all who made this project possible. We received invaluable help in many forms, from the sharing of insights and expertise, to the providing of data, equipment, or accompaniment to field sites, as well as academic support. In particular, we would like to extend a special thank you to our supervisor, Dr. Heckadon-Moreno, for his guidance, continued presence as an immeasurable source of knowledge and keen interest in our work. We also remain indebted to the scientific and support staff at the Punta Galeta Research Station, with a particular thought to Jorge Morales, Illia Grenald, Gabrial Thomas and Javier Hurtado – your hospitality provided us with a place in which to anchor our research, and your insights helped us to understand the issue within the context of Colón, as well as Galeta's needs.

We address a special thank you to our interviewees, who took time from their loaded agendas to discuss the plight of Colón with us – your insights offered perspectives that we could never have found in literature. Thank you also to the staff of the ANAM Library in Panamá City, who supported us through many days of reviewing dozens of EIAs and incessant requests for further documentation.

We would like to extend our gratitude to LightHawk, a US-based NGO, which gave us the incredible opportunity to fly in a light aircraft and take aerial photographs of our study zone. The creation of an updated 2014 land use map would not have been possible without the resulting data, and the overall quality of our work would hence have been seriously compromised. Finally, our thanks go to the Panama Field Study Semester teaching staff and our course colleagues for their continuous support throughout the project.

3.0 INTERNSHIP COMPONENTS

3.1 Host Institution

3.1.a The Smithsonian Tropical Research Institute

The Smithonian Tropical Research Institute (STRI) is a bureau of the Smithsonian Institution whose mission is to broaden scientific understanding of tropical biological diversity. It was founded in 1923 when the first research station was built on Barro Colorado Island, an artificial island which appeared with the damming of the Chagres, upon construction of the Panamá Canal. Today, STRI is host to 900 visiting scientists every year, who come from around the world to conduct research at STRI's many Panamanian stations ("About the Smithsonian Tropical Research Institute", 2014).

3.1.b Punta Galeta Marine Laboratory

The Punta Galeta Marine Laboratory has been part of the Smithsonian Tropical Research Institute since 1964, when it was bequeathed to the Smithsonian Institution by the Pentagon. Located on the North coast of the Isla Galeta Protected Landscape, the laboratory sits in a prime location for the study of coral reefs, marine ecosystems, and mangroves. It soon became a research station of global importance. Since 2000 and the full reversion of the Canal Zone to Panamá, Punta Galeta Marine Laboratory has played a vital role in building a bridge between scientists and Panamanian society ("Visit Us at Galeta - History." 2014).

Classified in Law 21 of 1997 as a *paisaje protegido* (protected landscape), Isla Galeta is a place of "special aesthetic quality whose primary objective is to conserve the biodiversity of the landscape, while giving locals the opportunity to enjoy it through recreational, touristic, scientific and educational activities" (translated by

authors from Ley No. 21., of 1997). Despite this status, Punta Galeta is under steady pressure from neighbouring ports and industrial development, which have eaten away at the surrounding mangroves in a search for land.

3.2 Contact Information

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3.3 Number of equivalent full days spent on project

	Number of days spent at Punta Galeta Research Station	Number of days spent in Panamá City	Total number of days	Total number of hours (based on average 8h day)
Chloé Debyser	12	28	40	320
Frederic Hoffmann	12	28	40	320
Total	24	56	80	640

Please see Appendix V for a calendar of task allocation

4.0 CONTEXT OF STUDY

4.1 Introduction

4.1.a The Issue Addressed

Isla Galeta Protected Landscape is an island located to the East of the city of Colon, on the Panamanian *costa arriba*. Untouched but for some abandoned military equipment and scientific experiments, Isla Galeta lies as a testimony to what the area would have looked like before human settlement. Tall mangroves cover the land, fostering biodiversity and providing valuable services. According to Alongi (2002), mangroves have qualities that make them "structurally and functionally unique" (Alongi, 2002:331). As shown in many studies, mangroves benefit from large above ground biomass, which makes them excellent carbon sequestrators (Hutchison *et al*., 2013; Siikamäki *et al*.; 2012, Twilley *et al*., 1992). Furthermore, the role of mangroves as a buffer against adverse weather conditions has been well documented, for example by Danielsen (2005) in light of the 2004 Indian Ocean tsunami. The mangroves of the Isla Galeta protected landscape in particular have been shown to be of critical importance for the fish nursing grounds that they offer and their overarching role in the maintaining of ecosystem health (D'Croz, 1985). The mangroves of Isla Galeta are therefore critical to the wellbeing of surrounding communities, rendering the tracking and limiting of their disappearance essential.

Punta Galeta Research Station lies at the tip of Isla Galeta Protected Landscape, less than 10km away from the Atlantic entrance of the Panama Canal. As such, the land and mangroves it homes are highly eyed by prospectors as a place of great development potential. Land all around has been cleared and converted to

industrial or commercial use, encouraged by the proximity of the Panamá Canal and the existence of the Colon Free Zone (CFZ). The latter was established in 1948 as an area within which commercial activities can be undertaken free of many regulations (Louis Berger Group, 2010). In fact, the only requirement is that a 5% dividend tax be paid to the government, with all import and export duties waived, as well as municipal and other taxes ("Panamá Offshore Legal Services", 2014). It has proved to be an incredibly profitable endeavour. In the year 2011, $14billions worth of goods were imported into the CFZ, while $15billion were re-exported, mainly to Latin America and the Caribbean ("Panamá's Colón Free Zone: Challenges and Opportunities of a Logistics Hub.", Lilly and Associates, 2012:1). The prospect of a large return on investment possible within the stable politico-economic setting provided by Panamá, with its fully dollarized economy (Berg & Borensztein, 2000), is very attractive to foreign and local investors. Thus, pressure to expand the CFZ is ever increasing ("Panamá's Colón Free Zone: Challenges and Opportunities of a Logistics Hub.", Lilly and Associates, 2012:4).

Other pressures come from port developments, as major marine platforms seek to refurbish their piers in anticipation of the Panama Canal expansion, and win back business lost as a consequence of high costs and the comparative advantage of the Suez Canal for the East US-Asia route (Conan, 2013). Furthermore, the lack of discrimination between domestic and foreign firms in Panamanian coupled with its good reputation among major credit ratings agencies, such as Moody's (Panamá was upgraded to a Baa2 in 2012 (Freedman, 2012)), render Panama an attractive place to invest in construction ("2012 Investment Climate Statement – Panamá", US Department of State, 2012).

This large-scale prospecting is seen not only as a threat to biodiversity, but also to the viability of the Punta Galeta Research Station as a research and educational institution. The scientists and staff of the station have expressed significant concern for the future of the Protected Landscape and surrounding ecosystems (Stanley Heckadon-Moreno, 2014). Confusion and stress are exacerbated by the unpredictability of the phenomenon at hand. Surprises associated with the sudden discovery of new projects already in advanced phases of development, or seeing of hangars shooting up without forewarning along the Transisthmic highway, are common.

The sporadic way in which these projects are seen through to completion is worrying, as it is a testimony to the complication and chaos within the system that is supposed to frame them. This makes planning long-term scientific experiments or simply forecasting change and lobbying for protection a daunting task, and underlines the importance of gaining a better understanding of the process of land use change on the outskirts of Colon, from its geographical reality to the political framework of its unfolding. Through the mapping and contextualising of land use change around the Isla Galeta Protected Landscape, we aim at informing the future research activities Punta Galeta Marine Laboratory. We also hope that the present study may serve as an educational and advocacy tool, hence promoting the empowerment of the Colon communities for the defining of their own landscapes and natural surroundings.

4.1.b Study Objectives

The Punta Galeta staff and scientists perceive the unpredictability and scale of project development around the protected landscape as a serious threat to their activities. Concerns arise from the lack of updated information regarding current land

use and land cover around the Protected Lanscape on one hand, and from citizen's inability to affect the outcomes of the surrounding landscapes on the other.

The present study seeks to address both of these concerns, by providing a physical geography and socio-political contextualization of the process of land use change as it unfolds in the outskirts of Colon. The objectives of this study were therefore defined, in cooperation with Dr. Stanley Heckadon-Moreno, as threefold.

1) Firstly, we assess current land use and land cover for the surroundings of the Isla Galeta Protected Landscape, as well as trends in landscape evolution. We provide the research station with an up to date land use and land cover map, which may prove valuable for educational and advocacy purposes.

2) Having provided a situation assessment of Colon's landscapes, we investigate the processes responsible for the observed landscape trends. In particular, we provide a complete database and map of all development projects approved by ANAM between 2010 and 2013 for the surroundings of Isla Galeta.

3) Finally, we explore the processes facilitating landscape change on the outskirts of Colon, with an analysis of the political dynamics and policy initiatives which frame Colon's mode of development.

4.1.c Study Zone

We have seen that the health of Isla Galeta's ecosystems is a source of concern for the research station's staff (Heckadon-Moreno, 2014) as development occurs all around the protected zone. It is therefore with this preoccupation in mind that we defined our study zone. Sayer (1991) emphasises the importance of buffer zones for the conservation of ecosystem health within tropical protected areas. At Punta Galeta, the staff is already noting ecosystem degradation associated with nearby

landfills, marine traffic and disturbing of sea beds, in particular on coral reefs and mangrove forests (McKinley & Piette, 2007).

Hence, if the forested buffer lying between the Protected Landscape and the construction zone were to be lost or compromised, the quality of the mangroves on Isla Galeta would in turn be affected. From this perspective, we chose to define our study zone as an equidistant buffer-zone around and including the Protected Landscape. A 5-km radius for our buffer was selected, for it yielded a study site that could feasibly be studied within the resources of our research project, and one of great interest because of the flourishing of development initiatives that the zone is currently experiencing.

Indeed, studying maps and aerial photographs shows that the bulk of the pressure on Isla Galeta comes from directly South of the Punta Galeta access road, just as it turns off Ave. Randolf. However, Isla Margarita, to the West, as well as Isla Largo Remo, site of the recently announced megaproject Puerto Verde, to the East, would be vital to our study. With a 5-km equidistant buffer around Isla Galeta's boundaries, our study zone stretches from Puerto Cristobal, on the far-side of Colón, to Bahia las Minas and parts of Buena Vista. This zone also includes recently growing suburban areas of Cativa and Sabanitas, and is shown in Appendix I.I *map 1*.

4.2 Review of relevant legal texts

Because the Panamanian legislative framework will prove critical for our study's contextualization and analyses, we feel that providing legislative background information prior to diving into our research effort will benefit our reader. Firt, it is important to note that Panama is a sovereign, centralised, and democratic state led by a President, his Vice Presidents, Ministers of State, a legislative assembly, as well as a Judicial body run by nine Magistrates (Aguilar-Alfu & Reddy, 2013). Judges rely on

the Constitution, Codes, Laws and Regulations to maintain peace and justice within the nation. The first constitution of the Republic of Panamá was approved in 1904, and currently the one in use is the 2004 version (Aguilar-Alfu & Reddy, 2013).

This Constitution includes a selection of articles that are particularly relevant to our study. Most notable of these is Chapter 7 of the third segment, *Derechos y Deberes Individuales y Sociales* (Individual and Social Rights and Duties), which is titled *Regimen Ecológico* (Ecological Regime). This includes articles 114-117, which state that:

- it is the fundamental duty of the State to guarantee the population lives in sanitary and uncontaminated environments; that
- the State and inhabitants of the national territory have the duty to develop in a way that prevents the contamination of the environment, and maintains ecological equilibrium; that
- the State will regulate access and use of forests, the lands and water environments in a way that will insure their preservation and survival; and that
- the Law will regulate the use of non-renewable resources in a way to minimize social, economic and environmental conflict.

These laws inform us that the approval of development projects in our study zone will be pending on governmental decisions. Yet, we will often note the destructive environmental consequences of approved projects, which may come into conflict with some of these constitutional rights or duties. This passage of the Constitution is included in its entirety, in its original Spanish, in Appendix II.

Law 41 of 1998 marks the foundation of the *Autoridad Nacional del Ambiente* (ANAM, Panama's environmental authority). Along with a set of regulations, it makes the submission of an Environmental Impact Assessment (EIA) a legal

necessity for any new construction project (this process is the focus of Chapter II of Title IV of Law 41, transcribed in its entirety, in its original Spanish, in Appendix I). These must include basic information on the projected construction as well as mitigation measures that will be taken to reduce its impact on the environment, and larger projects must include a report of public consultation in their EIAs (Asamblea Nacional de Panamá, 1998).

A further law of note is *Ley 6 de 2002*, which establishes standards for transparency in public affairs. It enshrines the rights of all person seeking public information to access it without having to provide justification (among others), in Article 2 of Chapter II (Gaceta Oficial, 2002). The rights in Law 6 of 2002 are fundamental in a fair public consultation process such as those required for EIAs.

It will become apparent throughout this study that governmental action and policy often clash with these laws, and that these types of conflicts are deep-seated within Panamanian politics.

4.3 Ethical Considerations

Measures were taken throughout the research and analysis phases of this study in order to ensure that our work conforms to the McGill Code of Ethics. Prior to beginning, both authors completed the Tri-Council Policy Statement's *Ethical Conduct for Research Involving Humans* course on research ethics (TCPS 2: CORE). Certificates of completion can be found in Appendix IV.

During the interview phase of our data collection, our affiliation to the Smithsonian Tropical Institute and to McGill University was clearly stated to all interviewees. Each was informed of the objectives and purpose of our research project prior to starting the interview, and were given the option to remain anonymous. They were also informed that they were free to refuse to answer any part of the interview

they may choose. Recordings of certain interviews were made upon receiving informed consent from the interviewee, and will not be released.

5.0 LAND USE & COVER - Update and Analysis of Trends

5.1 Introduction

On several occasions, the staff of the Punta Galeta Marine Laboratory expressed their longing for data on the current state of landscapes surrounding the Isla Galeta Protected Landscape, which would allow them to assess the health of these ecosystems and scope of the threat. As a result of discussions regarding potential ways of catering for this need, we set out to create an updated map of land use and land cover in our study zone. This map provides information regarding the extent of forested land and state of their surrounding environment. The data obtained will subsequently be compared with findings from similar past studies, and thus will allow us to report changes and trends. This map will provide the Punta Galeta Marine Laboratory with an easy-to-understand and complete representation of land use and land cover surrounding the Isla Galeta Protected Landscape, which should prove a valuable scientific and educational tool.

5.2 Methodology

Coen and Pollard's (2003) methodology for a similar project inspired the land use and land cover classification for this study, in order to allow for comparison across years. Two key divergences between our study and Coen and Pollard's (2003) are: (1) certain modifications in land use and cover classification had to be made due to historical changes in the landscapes of Colón, and (2) our study zone covered a broader extent. In particular, our project covers the Colon City area, which posed a classification challenge because of its many land uses mingled within a relatively small zone. We employed the Land Classification Advisory Committee of the Detroit

Metropolitan Area's (1962) recommendation to provide specific categorisations for particular 'mixtures' of land uses, and ultimately classified Colon City as "urban center," or in their words: "Constructed area in which housing units, shops, urban green space, recreational areas and administrative buildings come together in highly spatially intertwined way" (see Appendix I.IV. *Table 1*).

Our entire classification system, conceived to be comprehensive and non-overlapping, comprises 15 land use and land cover categories which are presented and defined in Appendix I.IV, *Table 1*. Category definitions are designed to prioritize considerations of land cover over those of land use. Indeed, the first criteria for classification is whether the area is built over, covered with trees, or neither; only thereafter comes the distinction amongst different types of constructed areas on one hand, and of forested zones on the other. This emphasis was intentional, for the types of landscapes surrounding the Galeta Island Protected Landscape matter in their coverage, which directly determines ecosystem functioning and health, rather than their anthropogenic usage.

The land use and land cover map was created using the Environmental Services Research Institute (ESRI)'s ArcMap 10.2 software bundle. The baseline shapefiles manipulated are "*AreasProtegidas*", "*Corregimientos*", "*DistritosPanama*" and "*RedCarreteras*", all obtained from the STRI online MapServer. These datasets are recorded in the UTM coordinate system, and projected on the WGS84 datum, Zone 17. They were originally compiled by the *Instituto Geográfico Nacional Tommy Guardia* (Panama's national geographical institute), and the *Autoridad Nacional del Ambiente* (ANAM).

Preliminary manipulations consisted in the creation, from the "*AreaProtegidas"* dataset, of a new shapefile named "*IslaGaleta"* which outlines

solely the Isla Galeta Protected Landscape. A 5km buffer was thence built around the latter, generating our "*StudyZone*" shapefile. Similarly, we used "*DistritosPanama*" to create a new shapefile, "*ColonDistrict*", which delimitates the district of Colón alone. The clip geoprocessing tool was used, with "*Corregimientos"* as the input shapefile and "*ColonDistrict*" as the clip shapefile, in order to obtain a new shapefile, named "*Corregimientos_Colon*". Similarly, the clip tool was employed in order to obtain the roads present in the Colón district only, "*RoadNetwork_Colon*". Finally, the clip tool was used with input "*Corregimientos_Colon*" and clip "*StudyZone*", in order to generate the "*Corregimientos_StudyZone*" shapefile. We made a copy of the latter, named it "*landuse_cover"*, merged all of its distinct polygons into one, and proceeded to its editing for the creation of the land use and land cover map. All final layers are placed within our geodatabase "*debyserhoffmann_galeta2014*" (see attached CD).

To begin, we added to our workspace the World Imagery ESRI base layer, which consists of a collection of satellite images aggregated to cover the entire globe and projected on the same UTM coordinate system as our GIS layers. The area of our study, at the greatest zoom level, is represented by satellite images dating from 2011 and has a resolution of 0.5m. The first stage of our analysis consisted in the digitizing, on the "*landuse_cover"* shapefile, of the different land use and land cover classes visible from the satellite imagery provided by ESRI. Digitization was done at a map scale of 1:6,000, and covered all landscape characteristics visible at that scale. The analysis included all land that falls within our study zone, including artificial landfills, but excluded roads, the surface of which was divided equally amongst adjacent land uses. If doubts arose regarding the certain areas' classification, a cross-check was completed using Google Earth, software which provided other 2011 satellite images for our study area, of which the visual quality was often superior to that of ESRI's

World Imagery. Together, these manipulations enabled us to obtain a 2011 land use and land cover map for our study zone.

We then proceeded to the updating of our dataset, such that it would contain 2011-2014 changes and be representative of landuse in 2014. On the occasion of a light aircraft flight generously provided by the NGO LightHawk in February 2014, we were able to collect data on the land use and cover through aerial photographs of the entire study zone. Pictures were taken horizontally when possible, but we had neither the flying time nor the material resources to take horizontal pictures covering the entire zone such that they may be georeferenced on ArcMap. Upon return, we reviewed our 2011 land use map with the help of these photographs, editing land use classes and formations when necessary. The result provides us with a land use and land cover map as our study zone stood on 22 February 2014, when the LightHawk flight took place. For comparability to be possible with the 2003 study, our map was clipped to fit Coen and Pollard's (2003) study zone (Appendix I.I. *Map 4*.).

5.3 Results

5.3.a A situation analysis

The obtained land use and land cover map (see shapefile "*landuse_cover*" in on the CD geodatabase an Appendix I.I. *Map 2*) enabled us to visualise the extent, distribution and localisation of different landscape types in our study area. Values for the surface area covered by each land use and land cover class were read from the map attribute table, subsequently to which the percentages of the total area were calculated (Appendix I.IV. *Table 2*) and graphically represented (Appendix I.I. *Fig. 5*). Results show that forest is the most abundant land cover class, with approximately 22,644,000m^2 or 38.9% of the total area. There is no recent nationwide census of

forest cover, however the 2000 census describes a forest cover representing 45% of the country's total land area (ANAM, 2011), which represents slightly more than that calculated for our study zone in 2014.

However, deforested lands also represent an important portion of the considered zone, with 8,972,000m^2 or 15.4% of the total area, as well as disturbed forests, with 5,395,000m^2 or 9.3% of the total area. Hence, as noted already by Coen and Pollard (2003), the surroundings of Isla Galeta Protected landscapes are characterised by high occurrences of deforested areas and disturbed forests.

Notable results are also found within the constructed land class categories. In particular, we note the 3,440,000m^2 of Colon Free Zone, which represent 5.9% of the total land area and 1.8 times the surface of the Colon City urban center. Port development also constitutes an important land use class, with 2,238,000m^2 and 4% of the total land area, along with Logistics Platforms, with 8.5% of the total land. Isolating constructed land use classes and visualising their relative proportion (Appendix I.I. *fig. 6*) confirms that, even though residential class is preponderant, the land uses associated with the Colon Free Zone, Port Development and Logistics Platforms represent a singularly important portion of the constructed urban and suburban area, with 16%, 11% and 9% of constructed land respectively. These figures therefore capture the nature of Colon as a city unique in its critical importance for world marine trade, with its population concentrated in large suburban residential zones and little space allocated to urban life or other economic sectors.

5.3.b Land Use / Land Cover Trends

From here, we built on the previous situation analysis and on Coen and Pollard's (2003) results to uncover trends in land use and land cover between 2001 and 2014. From our land use / land cover map for Coen and Pollard's study zone (Appendix I.I. *Map 3*), we

calculate the surface area associated with the Deforested Area, Forest, and Disturbed Forest classes in the zone, as well as the percentage of the entire zone that they cover (Appendix I.IV. *Table 3*). Moreover, we calculate these values for the aggregation of all constructed land use / land cover classes. Indeed, comparing our land use / land cover classes individually with that of Coen and Pollard (2003) was impossible, since we redefined these categories for the purpose of the present study.

Our results show that the Forest class experienced a 15.0 points decrease in the percentage of the total area that is covers, almost balanced by an increase of 11.3 percentage points in the Deforested Area category (Appendix I.IV. *Table 3*). On the other hand, the Constructed Area class presents a slight increase of 3.8%, whereas the Disturbed Forest category features a negligible change of 0.09%. Our study therefore uncovers the same deforestation trends as that largely encountered in the literature (Dow 2008) and highlighted by Coen and Pollard (2003), but does not reiterate the latter's findings of an increase in disturbed forest. Also, we suggest that Coen and Pollard's (2003) zone underwent a slight increase in constructed areas since 2001, even though a more precise dataset would be necessary to establish so with certainty.

5.4 Limitations

The accuracy of our land use and land cover map was limited by the datasets at our disposal. Indeed, in the absence of comprehensive 2014 satellite imagery for our study zone, we were forced to work with an outdated dataset, which was subsequently modified using amateur photographs. This technique proved extremely useful for the cross-checking of our land use map and generally comforted us regarding the accuracy of our work. However, accounting for discrepancies between our initial 2011 land use map and the 2014 aerial photographs proved challenging. Indeed, some aerial photographs had not been taken perfectly horizontally, leaving room for some interpretation in the digitizing of land features. Using multiple

information sources, our on-ground knowledge of the site and logical reasoning, we strived to reconstruct our map to the highest accuracy possible.

Shortcomings did not only lie in the digitizing of landscape features, but also in their identification. Indeed, some interpretation was necessary for the classification of certain land use and land cover categories, in particular that of the distinction between forest and disturbed forest. In order palliate this issue, we strived to define our land use / land cover categories as precisely and exclusively as possible (Appendix I.IV. *Table 1*). Moreover, we assured consistency throughout our mapping process by making a single researcher construct the entire map.

Overall, the fact that many zones displayed an exact match between the initial 2011 land use map and the 2014 aerial photographs, without the performing of any modification, gives us confidence in the accuracy of our base map. Furthermore, the potential for error lied in relatively small zones, difficult to identify and delimitate. We are therefore confident that, for the purposes of the Punta Galeta Research Station, the map created will consist of a sufficiently accurate and valuable tool.

5.5 Discussion

Our creation of an updated land use and land cover map for our study zone has enabled us to unveil a concerning deforestation trend, confirming findings outlined in the literature (Coen & Pollard, 2003; Dow, 2008). This phenomenon is all the more preoccupying, as it is occurring in direct proximity of the Isla Galeta Protected Landscape, and eroding buffer forest surrounding the area. In 2014, the direct surroundings of Punta Galeta largely feature important constructed, disturbed and deforested zones.

Extensive deforestation is also occurring further south of the protected landscape, in particular in direct proximity of residential zones. Furthermore, new

roads such as the *Carretera Panama-Colon* have recently carved passages through previously forested areas and will undoubtedly encourage further development, much like in the *Transistmica's* case. Such mega-projects are large influencers of the area's land use and land cover, and will have to be explored in depth if a comprehensive understanding of the deforestation phenomenon affecting Colon's surrounding landscapes is to be acquired.

6.0 DEVELOPMENT PROJECTS – Exploring the process of change

6.1 Introduction

We noted that the surroundings of Colon City are the locus of much deforestation, but have yet to explore the process through which this phenomenon is mediated. In order to do so, we wish to distinguish the formal deforestation initiatives from informal and organic ones, such as small-scale timber extraction or forest pillaging. The latter undoubtedly plays an important role in the observed deforestation trend, as suggested by the chaotic deforested land buffer which surrounds our study zone's residential areas (Appendix I.I *Map 2*) and contrasts with well delimitated deforested zones on the outskirts of the Colon Free Zone, and its accompanying port and logistics platforms.

Heckadon-Moreno (2014) has, however, repeatedly assured us that such informal deforestation initiatives, even though they might account for certain historically deforested zones, are not currently responsible for the large-scale deforestation currently affecting the surroundings of Isla Galeta. On the other hand, there is a strong perception at Punta Galeta and within the Colonese population that formal development initiatives are accelerating and dramatically encroaching on the area's forests. Their environmental impacts moreover tend to be greater than that of informal timber extraction and forest pillaging, as the land is not only denuded but also converted to construction, which impedes the ecosystem's regeneration potential and nullifies entirely its ability to provide certain ecosystem services, such as water

drainage. The present study will explore the process of formal land use change, in the form of project development, as it shapes the landscapes around Isla Galeta.

This focus is particularly relevant in the Colonese context, as, as we have seen, the area's constructed land is dominated by residential, free trade, port, and logistics land uses. Such a defining and land-intensive economical focus on global trade activities, prompted by the zone's unique geographical location, is bound to in turn affect its physical geography. The evolution of our study site's landscapes cannot be understood without accounting for the city's singular model of development, anchored in formal mega-project development.

In order to understand the formal project development process as it mediates Colonese deforestation, we first constructed a database of recent development projects for our study zone. This will enable us to explore the type of projects and investments that characterise Colon's development, as well as their original funding source. A second analytical level will be brought by our mapping of the projects within our study zones, which will allow for an analysis of the spatial distribution of project development around Colon. Both the database and the project development map are intended to provide Punta Galeta with complete and easily accessible informative tools, which may in turn be continually updated and used for educational purposes.

6.2 Methodology

Baseline data used for the construction of our database and development project map was collected from the ANAM library in Panama City. We reviewed all *Estudios de Impactos Ambientales* (EIAs) approved by ANAM for our study zone between January 2010 and December 2013. Indeed, an EIA must be submitted and approved before any type of work or project which could represent an environmental risk may be undertaken (see Appendix II). Hence, because changes in land use and

cover necessarily comprise an environmental risk, all formal projects which will affect the landscape should be filed with ANAM. EIAs are public documents and were hence readily accessible. Approximately 150 EIAs were reviewed for the entire district of Colon, of which 51 were found to fall within our study area and time frame.

For each selected EIA, a set of project characteristics was collected, namely the project title, majority prospector, total value of projected investment, GPS coordinates of project, company or individual which completed the EIA, photographs of the project maps and information specific to the EIA process itself (such as year submitted, year accepted, and reference number). Compiling entries for all EIAs enabled us to create a comprehensive development project database, compiled in Spanish, using Microsoft Office Excel software (see attached CD).

The first sheet on this database comprises the following data fields:

- Project ID (*Proyecto ID)*
- Name of project (*Nombre del proyecto)*
- Majority prospector (*Prospector mayoritario*)
- Country of origin of the prospector (*Pais de origen del prospector mayoritario*)
- Parent company (or highest traceable owner of the majority prospector, *Empresa matriz*, identified from a press review and extensive internet investigation)
- Country of origin of the parent company (*Pais de origen de la empresa matriz*)
- Year of ANAM approval (*Año de approbacion ANAM*)

- Type of project (*Tipo de proyecto*). The projects were categorised into the following types: Residential, Industrial, Commercial Port, Public Infrastructure, Commercial, Tourism, Other.
- Location (*Ubicacion*)
- *Corregimiento* (an administrative area at a level smaller than the district)
- Value in thousand Balboas (*Valor en mil Balboas*)

The second sheet of this database provides detailed information pertaining to the EIA process itself, with collected data including the year of EIA submission and ANAM approval, the EIA reference number and category, as well as the name of the environmental consultant in charge of the study.

The development project database was subsequently used to map 2010-2013 development projects in our study zone. As in the previous section, our product was created using the ESRI software bundle ArcMap 10.2. Baseline GIS layers are identical to those obtained from the STRI online MapServer for the compilation of our land use and land cover map.

The mapping work boiled down to the creation of a new shapefile for each of the 51 development projects, which consisted of the land surface covered by the project. In the majority of cases, digitization was accomplished by uploading the GPS coordinates of the project's location collected from our EIA review. However, for a third of the projects approximately, GPS coordinates provided were imprecise, inaccurate or entirely absent from the EIA. This challenge was overcome by georeferencing, with the help of 5 to 10 precise reference points, photographs of project on ground plans taken from the EIAs. The surface area of each project was subsequently digitized from the georeferenced photographs.

The obtained produce consisted of 51 shapefiles with a unique identification number, each delimitating the surface of a corresponding project. They were ultimately merged into a single "*Development_Projects*" shapefile. Finally, the first sheet of our project database was uploaded to the ArcMap 10.2 software, and joined to the "*Development_Projects*" shapefile in order for the information contained within it to be featured on their related polygons.

6.3 Results

6.3.a Project Type and Investment Size

The processing of our database has uncovered interesting patterns in 2010-2013 project development in our study zone. Graphically presenting the projects by type (Appendix I.II. *fig. 1a*) provides a visualisation of the domains in which investments are being made in Colon. We note that commercial projects form the most abundant category and are closely followed by industrial infrastructures, representing respectively 27% and 25% of all projects.

Considering investment sizes rather than project numbers associated with each project category provides us with new insights (Appendix I.II. *fig. 1b*). Whereas commercial ports only constituted 10% of all approved projects, they represent the category of highest investment, with 33% of all investments allocated to this project class. Public infrastructures are ranked second, with 30% of total investment, followed by industrial infrastructures (26%).

We therefore note a discrepancy between rankings of project categories based on shares of the total number of projects in comparison with that based on shares of the total investment. *Fig. 1c* (Appendix I.II) presents a visualisation of these differences, with *series 1* (blue) being the percentage of the total number of projects

for each project type and *series 2* (red) project type's share of total investment. We note important disconnects for the Commercial Ports and Public Infrastructure categories, which both present a share of investment notably higher than that of their number of projects (increase by 23 and 12 percentage points respectively), whereas the Commerce category displays the opposite trend (decrease by 17 percentage points).

These observations may be attributed to important variations in the average investment size associated with different project categories (Appendix I.II. *fig. 6*). With an average investment of $9,171,000, commercial port projects benefit from the highest funding levels. Public infrastructure and industrial projects also present a higher investment than the comprehensive average, whereas averages for commercial, residential, touristic and other investments are lower.

Even though there are notable differences in average investment across project types, the interquartile ranges of investments overlap across all project categories, as portrayed by our box plot depiction of the dataset (Appendix I.II. *fig.* 7). Hence there is no statistically significant difference amongst the investments associated with projects of different categories for our 2010-2013 sample size, and differences in averages are generated by exceptional megaprojects.

6.3.b Investment Size and Prospector Origin

Having explored the relation between investment size and project type, we include considerations of the origin of the project funding. *Fig. 2a* (Appendix I.II. *fig.* 2) displays the breakdown of investment by country of origin, for all projects in our study zone. It clearly shows Panama to be the overwhelmingly preponderant investor, with 99% of the investment share. Considering only foreign investments (Appendix I.II. *fig. 2b*) allows us to identify major international players, such as Taiwan.

While it appears on the surface that the overwhelming majority of investments are Panamanian, conversations with Dr. Heckadon-Moreno (2014) have brought to our attention the existence of local "shop-front" companies used by multinational corporations when operating in Panamá. Our subsequent retracing of prospectors' parent company enabled us to visualise the origin of project's highest traceable investment (Appendix I.II. *fig. 3*). This new analytical tools portrays a decrease of Panama's funding share to 15% of total investment only, and depicts a Colon dominated by foreign presence and funding sources.

A majority (50%) of the region's total investment thus appears to come from the United States of America, with investments from the likes of Chevron. Other major players are Germany (18% of total investment) and Japan (15%).

6.3.c Spatial Distribution of Development Projects

Development projects approved in our study zone for the years 2010-2013 differ in their project type, investment size and investment source. Moreover, they feature interesting patterns of spatial distribution. Indeed, a qualitative analysis of our project development map (Appendix I.I. *Map. 7*) shows that two zones present the highest level of land coverage by approved development projects: the zone that was denominated Coen and Pollard Study Zone in the previous section, as well as the Bahia Las Minas area, in particular at the location of Rafinería Panamá. On the other hand, the residential areas of Sabanitas and Cativa feature very little development project coverage. This contrast unveils a major inequality in Colon's contemporary development, with a focus placed on the region's international trade facilities in opposition to that of the living and interacting space of the Colonese population.

6.4 Limitations

The present section of our study may only be as accurate as that of the data provided by ANAM. The environmental impact assessment mechanism has been subject to much criticism in the literature (McKinley & Piette, 2007) and amongst our interviewees. This questionability of the data provided by ANAM was confirmed by the high occurrence of incorrect GPS coordinates within the reviewed EIAs. Moreover, incoherent coordinate systems where employed, from NAD27 datum projection to WGS_84. Degrees and decimal minutes were used interchangeably with UTM and degrees; sometimes even the easting and northing were exchanged. Even though these errors were corrected using the GIS software ArcMap 10.2, map observations and a good knowledge of the area, they nonetheless underline an unprofessional data collection on the part of environmental consulting companies and raise the possibility that some mistakes overlooked by ANAM were in turn not identified by the researchers.

Furthermore, information pertaining to the value and origin of investments found in the EIAs may not always accurately represent the reality. Because EIAs, are conducted prior to the project construction, they cannot account for unexpected costs associated with unpredicted delays in construction or technical difficulties. Ensuring a higher accuracy of our investment dataset would have required following up with the prospectors after construction. Considering our time limitations and company's reluctance to cooperate with us, this was unfeasible within the scope of our study.

6.5 Discussion

Even though there appears to be no significant relationship between an individual project's investment size and its functional category, our results show that the share of total investments allocated to the aggregation of all projects within a single category differs widely amongst functional classes. Cumulatively, much more money is spent on projects of commercial ports, public infrastructure and industry than on tourism, commercial or residential initiatives. The Colon depicted is therefore one of acute focus on international trade and public infrastructure.

These findings are concordant with the spatial distribution of project development, for we found the greatest surface of land covered by development initiatives to occur in zones of port and industrial use, where megaprojects are aggregated. A historical comparison of the land use and land cover maps presented in the previous section of this research report shows that these areas have suffered from high deforestation rates. It appears that large-scale development has acted as a mediator of ecosystem destruction in the Colon surroundings.

Moreover, surpassing a single layered analysis of investment sources by retracing companies to their headquarters has enabled us to unveil the flooding of Colon's economy by foreign funds. Prior to our work, other studies have shown that foreign money is permeating not only the area's infrastructure building, but also its flows of merchandise and labour. Sigler (2014) analyses the specific role of the Colon Free Zone for local economy, emphasizing its attractiveness for foreign investments and the lack of benefits returned to the Colonese population. In turn, Guevara Mann (2011) shows that complex power plays at all decision-making levels in Panama gives birth to an immune elite which becomes the sole benefiter of the country's economy, at the detriment of local wills and aspirations. Having unveiled trends of deforestation

in the surroundings of Punta Galeta and identified processes responsible for the reshaping of the region's landscape, we will thereafter explore the political dynamics at play in allowing such megaprojects to unfold as they do – and hence explore the drivers behind the transformation of Colon's landscapes.

7.0 POLITICAL ANALYSIS – Understanding the drivers

7.1 Introduction

While the maps presented above provide a tool for visualising the issue at hand and can serve the education mission well, a deeper understanding of the development at the study site can be attained through a social approach. Combining stories we have heard, read, and researched into a short analysis of the political landscape of Colón will enhance the value of this report by attempting to provide an explanation and backdrop to its social climate. This analysis will provide us with insights regarding the processes enabling the remodelling of Colon's landscapes.

Breaking down the power relations and hierarchy in the process is aimed not only at understanding the workings of the system, but also at identifying its ills and potential strengths. In order to gain this insight, we deemed interviews, as a main source of information, would yield the best results considering our time constraints. This political analysis peruses the line between politics and policies, and, as some interviews have shown us, the contrasting trends these follow. While some of our sources complemented each other, not all shared positions, and many helped unveil the faults of the Panamanian political system.

Diagrammatic representations of the relations within and between certain stakeholders have been built so as to enhance understanding of the outcomes and visualise findings from interviews complemented by information from official governmental sources. These are provided to help conceptualise the matter at hand and can be used as a tool to complement the maps in education and advocacy.

7.2 Methodology

Interviewees were selected using a convenience sampling methodology, as our aim was to target key stakeholders of Colon's land use planning and execution. In our effort to get a wide scope of views, we reached out to stakeholders from a variety of backgrounds. Each interview was thereafter conducted in a semi-structured manner. Beginning with the stating of our motivations in conducting this research, the context of our presence in Panama and small talk on the theme of Colón, the interviews slowly transitioned into a set of premeditated questions. Most were recorded, with the consent of the interviewee, for the integrity of the formal interview part. The question-asking task was passed shared between the researchers.

Our interviewees were selected based on our goal of obtaining input from as wide a selection of backgrounds as possible. We were especially keen on hearing from the governmental agencies involved in the process, urban planners with the inside story, people who have been vocal on the issues, and representatives of the private corporations operating in the area. Stanley Heckadon-Moreno introduced us to Graciela Arosemena, an urban planner actively involved in the update of Panama's Plan Metropolitano. She then put us into contact with Joel Cerras, formerly of the *Ministerio de Vivienda y Ordenamiento Territorial* (the Panamanian housing ministry, MIVIOT), who was able to share some valuable information on the hurdles to spreading the wealth generated in Colón's industrial, port and commercial sectors to the Colonese. We were then able to meet Ms. Roberts, of the Colón Chamber of Commerce, a group that represents the interests of companies with commercial activities in the area. Vital information regarding the motivations and concerns of those operating in the Free Zone, its surroundings, and the city of Colón were discussed. Seeking to further our understanding of this particular aspect, we reached

out to Mr. Lam, an associate lawyer at Coronell y Lam Asociados. Mr. Lam works closely with the Colón Chamber of Commerce, and was able to share great insight into the legal side of commercial activity in Colón. He was also involved with the *Foro Visión Colón*, which was held to discuss the future of the city and its surroundings. During our time in Colón, we contacted a selection of stakeholders taking part in the development of these projects, for their side of the story. Sadly, all ports and private corporations contacted refused to comment or meet, and simply directed us to the sparse information available on their websites, which in all cases was not enough to answer our questions. Before returning to Panama City to continue interviews, we spoke to a representative at ANAM's Colón office, where we discussed the process behind the submissions of Environmental Impact Assessments.

The *Autoridad Maritima de Panamá* (the governmental authority which rules over all things related to shipping and shore-side concessions in Panamá, AMP), *Ministerio de Economia y Finanzas* (Panama's Ministry of Finance, MEF), as well as the *Autoridad Nacional de Transparencia y Acceso a la Informacion* (Panama's authority on transparency in public affairs, ANTAI), all based in Panama City, were indentified in Colon as stakeholders of interest, and visited as soon as we returned to the Capital. We were able to meet with representatives of the AMP and ANTAI, while the MEF office said it was not their responsibility. Our final meeting was with Kurt Dillon, an urban planner whose work has focused strongly on Colón's development.

For each interview, we started off sticking rather rigidly to a set of questions, while phrasing and details differed slightly depending on the interviewee. After our second interview we came to the realisation that a more flexible approach to the interview structure was fruitful, as it allowed us to discuss aspects we had not

foreseen. Despite this, we took care to respect the three overarching themes we had committed to following in the original question set. These were: “Why is there port/industrial development around Colón?”, “Why is it so successful and fast-paced?”, and “Why is information not readily available?”.

A transcript of the original set of questions can be found in Appendix III. Question 2 of the second portion is a participatory technique we chose to use as a way of prompting the interviewee’s mind without biasing results through suggesting answers orally. It was a way to slip sensitive subjects, such as corruption, into the conversation, and allowing the interviewee to ignore them if he or she felt uneasy talking about them. This technique was included in our first two interviews, but abandoned for subsequent ones, as it proved to not be as fruitful as expected, and in fact tended to detract us from the conversation without bringing in new subjects. This can perhaps be attributed to our increasing confidence and ability in Spanish interview-making as time went on, which allowed us to ask questions and address issues we feared would be beyond our skill set at the beginning.

7.3 Results

The findings from these interviews fall into two distinct categories, and thus will be reported as such. We collected and analysed information regarding: (1) the hierarchy and dynamics between different state institutions, in particular regarding land planning policy-making, (2) issues in environmental governance with the ANAM institution. Following a breakdown of results and a brief discussion of these, a third leitmotif, which gives an idea of how our interviewees would ameliorate the situation, will be presented as a synthesis and conclusion to Part II.

7.3.a Governmental hierarchies and land planning

An underlying theme to all of our interviews was that of poor governmental structure and organisation for land planning policy-making and implementation. Land use planning is intrinsically linked to land use development and trends in construction, and thus its central role in our study had been anticipated. However, the strength of interviewee's opinions on the matter came as a surprise, and extended the issue under consideration further than strictly land use planning.

Ms. Arosemena, an urban planner and architect actively involved in planning in Colon, pointed out a lack of integration between government agencies in Panama (Arosemena, Personal Communication, 2014). The lack of communication that exists between agencies means that costs and risks are offset to the neighbour, and little regard is given to the outcome of ministries and authorities working in the same area. This represents an important institutional failure, through which large risks, both with environmental and human costs, are incurred. For example, the expansions of Enrique Jimenez Airport, neighboured by the expansion of port and logistics parks without coordination with the *Ministerio de Obras Publicas* (Ministry of Public Works, MOP), resulted in recurrent and widespread flooding along Avenida Randolf, which runs right through Colon's industrial lung. Thus, the failure to organize and ensure such important considerations as drainage infrastructure is adequate led to operations at some of Colon, and thus the Caribbean's, largest ports being seriously compromised, not to mention the lives of residents put at risk (Heckadon-Moreno, Personal Communication, 2014). These issues are exacerbated by the mere fact that they occur within a highly centralised nation.

Panama's governmental centralisation means more than simply all the decisions are made in Panama City. Mr. Dillon argued that this allows larger, often

multinational, corporations to simply wriggle themselves into profitable contracts through getting in the good books of certain members of the administration (Dillon, Personal Communication, 2014). Prime examples of this are Costa Rican construction company Meco being awarded the construction of the Jimenez airport, or Brazil's Odebrecht receiving the contract to build the last leg of the Autopista Madden-Colon. A further, and more important issue (as it can have a direct and serious effect on the lifestyles of the people of Colon), is that this centralisation results in the most important Colonese decisions being made by people who are not from Colon (Ceras, Personal Communication, 2014). The federal laws which rule upon the Colon Free Zone (CFZ) serve as an example of this. Through Law 18, the founding text of the CFZ, the government is given the right to give concessions and rent land to whom it pleases within the boundaries of the CFZ (Lam, Personal Communication, 2014). The fact that the land is Colonese but the concessions belong to the government entails that the social and environmental costs related to the activities within them remain local, while the profits are repatriated to Panama City.

On the broader scale, when it comes to land planning, the issue of centralisation paired with that of a lack of communication between governmental institutions takes amplified meaning, as local knowledge and cooperation are fundamental aspects of successful planning.

Meeting Joel Ceras was instrumental in understanding the land planning process. He described a "macro-level" plan (Ceras, Personal Communication, 2014), which is regulated by the MIVIOT and concerns the zoning of the land. It is meant to be updated every 15 years, although the current one dates back to 1997 and only in phase two of four of its renewal. This plan, known informally as the *Plan Metropolitano*, defines zoning for Colón and Panama City, and provides guidelines

and restrictions for the "district level" plan. The district level plan rules on a smaller scale the use of the land, and the one for Colon is focused only on the Colon area. A district level plan has been created for Colon by The Louis Berger Group, and international consultant based in Panama City. This document, known at the *Plan de Ordenamiento Territorial*, is waiting for the conclusion of the update of the *Plan Metropolitano* before the government can approve it. Its strengths and weaknesses are discussed further below. A level further below this is the *Nivel Local*, where individuals can organise to propose a land use plan for any Corregimiento, which can come into force if approved by the MIVIOT (Ceras, Personal Communication, 2014).

Delving further into each of these plans uncovered some problems engrained deep within their existence, which resonate with the ones described earlier. Firstly, acting on different levels, these plans do not cover the same extent of land. This, in itself, would not be an issue if the land not covered was defined, and another organisation were to take care of it. The issue here, is that if it is not under anyone's jurisdiction, there is literally no zoning law, and construction is virtually unregulated. A further problem in the concordance of plans is that each level depends on the one above it, yet is not consulted in the construction of it. This means that creating coherence between each is a difficult and timely process. Appendix I.III includes a diagrammatic representation (*diagram 1)* of the hierarchy between the plans and feedback of reliance.

7.3.b Environmental governance and ANAM

Adding to the issues relating planning to environmental governance, a resounding consensus among people interviewed is ANAM's inability to do its job. As the national authority on environmental matters, ANAM should be setting the example of environmental governance within the nation. The main issue interviewees

took with ANAM was their position vis-à-vis economic development and construction projects. The EIA process was billed as too lax and inappropriate for the task. For example, Mr. Lam voiced concern regarding the public consultation phase of EIAs, saying that they are easy to falsify and overlooked by ANAM anyways. He claims ANAM never refuses an EIA (Lam, Personal Communication, 2014). Interestingly, however, he lays the blame on the government as a whole rather than only ANAM, claiming that they lack support. This, Lam argued, is the reason they do not act, as they do not feel powerful enough to do so (Lam, Personal Communication, 2014). Urban planner Mr. Dillon furthered this opinion by placing the blame upon the system also, claiming that the central government uses its power to hinder ANAM's ability to make its own decisions (Dillon, 2014).

At the AMP, ANAM was criticised for failing to prevent the government from changing legislation regarding the Bay of Panama Ramsar protected wetland to allow for development, evoking, like Mr. Lam, their lack of power when faced with governmental forces (AMP Legal Department Representative, Personal Communication, 2014; Lam, Personal Communication, 2014). It is astonishing, yet encouraging, that the AMP, in charge of regulating Panama's port development, would be critical of the government for putting port development and marine trade ahead of the environment. However, Joel Ceras, formerly of the MIVIOT, questioned the will of ANAM, claiming ANAM seemed to put economic growth ahead environmental protection (Ceras, Personal Communication, 2014). Thankfully, legislation protecting the Bay of Panama Ramsar site has been partially reinstated due to lobbying by the Panama Audubon Society, among others (Birdlife International, 2014).

A visit to the ANAM regional office in Colon allowed us to make our own opinion of it all. First of all, the fact that only level I (low impact) EIAs are treated locally is concerning. All the rest, they told us, is sent to the central office in Panama City. There, people who may know nothing about Colón or the plight of its inhabitants or environment make decisions based on questionable recommendations made within the EIAs. The centralisation of the system and lack of power given to regional offices is an important factor keeping ANAM employees from doing their job. In fact, at ANTAI we were told that the laws of ANAM being as week as they are, it is hard to expect anything from them, and these must be reformed if ANAM is to be expected to do anything (ANTAI, 2014). One interviewee, whose indentity we will not reveal to protect their anonymity regarding this particular issue, even stated that the country would benefit from closing down ANAM, because it would be better to openly have nobody take care of the environment than have a an agency pretend to.

On the whole, it was expressed by our body of interviewees that ANAM and the system which supports it (for lack of a better word) is inadequate to provide sound environmental governance in Panamá.

7.4 Discussion

The problems with Panamanian politics, which were described and discussed at depth with our interviewees, provide a web of issues that propagate environmental destruction and degradation in the area surrounding Isla Galeta through fostering investment and growth. The holes that are created through the absence of local governmental power are exploited by investors, and investor pressure is incentivising the federal government to keep these holes open. The power plays between investors and government officials take place without all stakeholders at the negotiating table, and thus the concerns of all are not represented and the benefits not

distributed fairly. By excluding some from the political process, policies fail to serve all fairly. A diagrammatic representation of the structure of the Panamanian government (*diagram 2*) is provided in the Appendix I.III, which shows both its verticle structure and the lack of links between Ministries and Authorities of same level. This is complemented by a visualisation of the *authority-web* (*diagram 3*) that influences effective land use. This shows the roles of a selection of players and the communication patters that exist between them. The information for these was reaped through our interviews and governmental web resources.

7.5 Limitations

The vast complexity of development in Colón is the primary limitation we met. Finger pointing, blame offloading and role-denying were commonplace, and actually obtaining answers was a path rich in obstacles. The weak governmental organisations and fear of being associated with such cases was probably to blame for this. However, these limitations were foreseeable, and intrinsic to such a study.

A set of limitations we were expecting to encounter, and are similar to that mentioned above, are those that can be associated with discussing taboo subjects. We feared and were warned that many stakeholders may not want to talk with us, and that we should tread carefully when inquiring on certain matters. To our great surprise, while this was the case in certain situations, many interviewees responded positively. In fact, some said that they were keen on being heard on these subjects, and spoke candidly about the corruption issue within their country, regardless of the microphone placed on the table.

Being denied the rights engrained in the transparency Law 6 of 2002 was an obstacle we were not expecting to meet, however. Upon seeking information at ANAM we were asked to show justification for our enquiry, something explicitly

stated as unnecessary in the law. This added delays to the collection of data, and thus took time from analysis.

7.6 Visions for the future – Conclusion of the political analysis

As each interview wound to an end, the interviewee was prompted for a solution to what started to informally be known as "The Colon Issue" – or simply how to mitigate the devastating rate of destruction currently occurring in Colon. Trends here were very telltale. Kurt Dillon, to start with, called for an integration of Isla Galeta into Colon, claiming that if the people of the City felt closer to the mangroves of Galeta (something Mr. Dillon reminded us was what Colon would have looked like before the railroad, over 150 years ago), they would mobilise to protect it. As protests in 2012 showed, locals have the power to affect policy and determine the development of their lands. By bringing the ports to a grinding halt, the Colonese can use attract international media coverage and pressure the government into responding to their requests. However, it could be argued that the residents of Colon should not have to result to such drastic measures to protect their interests. Mr. Lam calls for a strengthening of regulations, and that by setting stricter rules for environmental assessments and keeping investors to higher standards, the issues with Colon could be solved. The authorities at the AMP say, similarly, that these higher standards should also be applied to the government, and that the cooperation and coherence previously billed as a downfall needs to be addressed. Adding to this, Mr. Ceras puts the solution down to a change in political will, claiming that a new president less focussed on pure, brute, economic growth could see this through. The environment needs to be taken seriously and sensibly within Colonese development, and the problem needs to be approached at the "macro-scale" (Ceras, Personal Communication, 2014). In fact, Ms. Arosemena wishes to see a future where Colon is completely rebranded as a

model for a green city, claiming that its layout and size make it fit the bill perfectly. Finally, the director of ANTAI was fervent that for any change to make its way into politics, it must come from society, and the educational system needs reform in order to foster this change from within.

Clearly, each interviewee took a slightly different approach to our questions, and the discussion evolved in slightly different ways. This is exactly what we were looking for in interviewing from a range of backgrounds, and provided us with holistic answers and understanding of the issue. They each provided answers to their concerns, which resonates with the genuine will we have found people to have to protect the mangroves of Galeta and mitigate the impact of heavy investment. However, these interviews did testify further to void of an organised, continually present opposing front. There has been successful mobilisation in times of need, such as by the *Frente Amplio de Colon* during the 1996 lobbying and 2012 protests (Dillon, Personal Communication, 2014), but a larger, unified and more permanent movement has yet to emerge.

8.0 CONCLUSION

8.1 The Future of Colon: a Story of Diverging Scenarios

Colon, a city of historically central importance in matters of trade and travel across the Isthmus, has continuously faced pressure to develop since the Americans built the Railroad there in the 1850s (McCullough, 1977:35). Even before that, in the times of Balboa and Columbus, the Caribbean coast by Colon was host to high density of activity and development (*Museo del Canal Interoceánico de Panama*, 2014). Despite this legacy of investment and growth, Colon is finding itself under the eye of investors more than ever before. With the expansion of the Canal and the global economy seemingly on the mend, investors from the world over are building in Colon.

As has been made clear through this study, the obstacles facing Colon are manifold, and predominant among these are the exact incentives provided by its location. Based on our study, it is possible to build an outlook on the current landscape of Colon, and ponder which path its evolution will follow.

How this development happens will rely heavily on governance, and political will of Panamanians and particularly their leaders. Through researching and sharing with experts, we have seen two potential outcomes emerge for Colón, each following a very different road. On the one hand the creation the *Plan de Ordenamiento Territorial* offers an alternative that would benefit the people of Colon, all the while accommodating the heavy investment in a responsible way. On the other, the recent public announcement of *Puerto Verde*, a mega-port project scheduled to be completed by 2020 on Isla Largo Remo, would take Colon further down its destructive road. The latter is, unfortunately, in line with current practices, and exhibits striking disregard of

environmental and social implications. However, if the right momentum is gained, the *Plan de Ordenamiento Terretorial* has real potential to curb Colon's irresponsible actions, and mitigate future devastation. The two, regardless, need to be considered. A brief overview of where each project stands at the time of writing is provided in the Appendix VI.

8.2 Recommendations: long term monitoring

Following the completion of this study, and being a witness to the destructive rate of expansion and plight of the people of Colon, we now wish to set out some recommendations. A study such as ours, tracing the extent and intensity of construction and investment, can become truly valuable if regularly followed upon and updated. If the database of projects is expanded as new ones come along, if the political analysis is deepened as stories unfold and information is unveiled, trends may be seen and action taken. The tools we have provided will only serve to their full potential if they are used and built upon.

Therefore, we would like to recommend this internship project be repeated at regular intervals, ideally every three, maximum five, years. By assigning the task of continuing this study to interns in the future, a true long term monitoring of Colon's growth can be put into place. This will prove to be an invaluable tool in keeping those interested informed, and prevent construction from creeping up on scientists, as it seems to today. We suggest a methodology similar to our own be used, and adapted as seen fit. For example, statistical tests could be run to find significance in correlations between contiguous land uses of the land use map. Moreover, considerations of informal deforestation practices would add a valuable dimension to this study. As years pass, advocacy and education can be informed by the data accumulated, and the

interests of the concerned people of Colon, Punta Galeta, and STRI can be attained, aided by these tools.

8.3 Authors' Final Conclusions

Through the compiling of our database, the construction of our maps, and the long and insightful conversation we have held with a variety of people involved with or concerned by the rapid expansion development in Isla Galeta's neighbouring land, a deeper understanding of the situation has been obtained. The results from our maps have shown us that, in the 2010-2013 time lapse, the major investments in our study zone were predominantly of port or commercial kind, with public infrastructure also representing a large share of development. The projects were funded for the most part by foreign multinational corporations, but this was done through local, Panamanian, companies.

Years of investment into Colón have lead to its landscapes being heavily shaped by commerce. The land use map of the area has permitted us to determine more precisely the proportion of land covered by forest (39%), ports (15.4%), urban Colon (3.3%), and more. Moreover, an important deforestation trend was empirically reaffirmed.

The political landscapes studied within this report have uncovered structural issues with Panamanian politics, such as the centralisation and communication ones discussed with our interviewees. The influence of these in allowing for policy that tolerates the current rate of development and hinders local participation was a key finding in our study.

While the results that can be pulled directly from this study stand alone as interesting facts, the authors cannot stress enough the added value a continuation of this study would provide. The increased depth of analysis and robustness of

arguments that could be made from it would equip scientists and advocates with strong tools to fuel their defence. Considering the diverging teleologies Colon currently faces, the future of the city in uncertain. We argue that it is time for the voice of civil society and concerned citizens, whoever they may be, to be heard. The tools provided here will, we sincerely hope, help in this mission. The upcoming presidential elections (early May of this year, only a few days after this report will be submitted), have the potential to change the political landscape of Panama drastically. The transition period could provide an opportunity for citizens to enter the decision-making processes and extend to the people of Colon agency over their own land.

REFERENCES

About the Smithsonian Tropical Research Institute. (n.d.) *Smithsonian Tropical Research Institute*. Retrieved from http://www.stri.si.edu/english/about_stri/index.php (20 Apr. 2014)

Alongi, Daniel M. (2002). Present state and future of the world's mangrove forests. *Environmental Conservation, 29*(3), 331-349.

AMP Legal Department Representative. (2014, April 8). Personal Interview.

ANAM. (2011). *Atlas Ambiental de la Républica de Panamá*. Panama, PA: Autoridad Nacional del Ambiente.

ANAM, Office Representative. (2014, March 31). Personal Interview.

ANTAI, Director. (2014, April 8). Personal Interview

Arosemena, G. (2014, March 21). Personal Interview.

Aguilar-Alfu, A., & Reddy, K. (2013). *A Guide to Panamá's Legal System and Research*. GlobaLex. New York NY: NYU School of Law. Retrieved from http://www.nyulawglobal.org/globalex/Panamá1.htm (20 Apr. 2014)

Arosemena & Ramos. (2013). *Comentarios de CIAM al EsIA Puerto Verde*. Panama City: Centro de Incidencia Ambiental

Berg & Borensztein. (2000, December). *Economic Issues No. 24 -- Full Dollarization*. International Monetary Fund. Retrieved from http://www.imf.org/external/pubs/ft/issues/issues24/ (20 Apr. 2014)

Birdlife International. (2014, April 9). *Protected status for Panama Bay reinstated by court ruling*. Birdlife International. Retrieved from http://www.birdlife.org/worldwide/news/protected-status-panama-bay-reinstated-court-ruling (21 Apr. 2014)

Ceras, J. (2014, March 28). Personal Interview.

Coen, S. & Pollard, M. (2003). *1976-2001 Geographical Changes on Isla Galeta*. Unpublished report for McGill University and the Smithsonian Tropical Research Institute, Panama.

Conan, R. (2013, April). *Maersk not abandoning Panamá, but shifting Asia-US east coast trades to Suez*. BNamericas. Retrieved from http://www.bnamericas.com/news/infrastructure/maersk-not-abandoning-Panamá-but-shifting-asia-us-east-coast-trades-to-suez (20 Apr. 2014)

Danielsen, F. et al. 2005. The Asian tsunami: A protective role for coastal vegetation. Science, 310, 643-644.

Dillon, K. (2014, April 9). Personal Interview.

D'Croz, L. (1985). Manglares: su importancia para la zona costera tropical. In Stanley Heckadon and Jaime Espino (Eds.), *Agonia de la naturaleza* (pp. 167-180). Instituto de Investigacion Agropecuario de Panama (IDIAP) and Smithsonian Tropical Research Insitute (STRI), Panama.

Dow, E. J. 2008. *The Effect of Land Use/Land Cover on Mangrove Forest in the Northeastern Panama Canal Region*. Unpublished report for University of California, Berkeley, California, USA.

Freedman & Oosterveld. (2013, October). *Moody's upgrades Panamá to Baa2*. Moody's Investors Service. Retrieved from https://www.moodys.com/research/Moodys-upgrades-Panam%C3%A1-to-Baa2--PR_258683 (20 Apr. 2014)

Guevara Mann, C. (2011). *Political Careers, Corruption, and Impunity*. South Bend, IN: University of Notre Dame Press.

Heckadon-Moreno, Stanley. (2014). Personal Communication.

Hutchison, James, Manica, Andrea, Swetnam, Ruth, Balmford, Andrew, & Spalding, Mark. (2013). Predicting global patterns in mangrove forest biomass. *Conservation Letters*, n/a-n/a. doi: 10.1111/conl.12060

Jaramillo. (2014A). *Ejecutivo autoriza la venta de isla*. La Prensa. http://www.prensa.com/impreso/panorama/ejecutivo-autoriza-venta-isla/308688 (20 Apr. 2014)

Jaramillo. (2014B). *El Ejecutivo vende isla; manglares estan en peligro*. La Prensa. Retrieved from http://www.prensa.com/impreso/panorama/ejecutivo-vende-isla-manglares-estan-peligro/308706 (20 Apr. 2014)

Lam, J. (2014, March 31). Personal Interview.

Land Classification Advisory Committee of the Detroit Metropolitan Area. (1962). *Land Use Classification Manual*. Chicago, IL: Public Administration Service.

McCullough, D. (1977). *The Path Between the Seas: The Creation of the Panama Canal, 1870-1914*. New York: Simon and Schuster.

Ley No. 21. (1997, July). Asamblea Legislativa, *Gaceta Oficial*, 23'323, Edited by Pardor, Gracia, Balladares and Castro. Panamá City.

Ley No. 41. (1998, July). Asamblea Legislativa, *Gaceta Oficial*, 23'578, Edited by Vernaza, Mitchell, Balladares and Luciani, Panamá City.

Ley No. 6. (2003, January). Asamblea Legislativa, *Gaceta Oficial*, 24'476, Edited by Núñez and Valdés, Panamá City.

Lilly and Associates. (n.d.). *Panamá's Colón Free Zone: Challenges and Opportunities of a Logistics Hub*. Lilly and Associates International Transportation + Logistics. Retrieved from http://www.shiplilly.com/rates/PanamáCFZLogisticsHub.pdf (20 Apr. 2014)

Louis Berger Group, Inc. (2010) *Elaboracion del Plan de Ordenamiento Territorial Del Distrito de Colón, Provincia de Colón, Republica de Panamá*. Panamá City: Louis Berger Group, Inc.

McKinley, A., & Piette, M. (2007). *The Mangrove Forests of the City of Colon: A Situation Analysis, Socio-Economic, and Environmental Impact Assessment of Development Initiatives*. Unpublished report for McGill University and the Smithsonian Tropical Research Institute, Panama.

Panamá Offshore Legal Services. (n.d.) *Panamá Tax Free Zones*. Retrieved from http://www.Panamá-offshore-services.com/Panamá_tax_free_zones.htm (20 Apr. 2014)

Permanent Exhibition. (2014). Museo del Canal Interoceanico de Panama. Calle 5a Este, Panama City, Panama. (14.02.2014)

Resolucion de Gabinete N°59. (2014, April). Consejo de Gabinete. *Gaceta Oficial*. 27'412. Edited by Henriquez et al. Panamá City.

Roberts, Z. (2014, March 28). Personal Interview.

Sayer, J. (1991). *Rainforest buffer zones: guidelines for protected area managers*. International Union for Conservation of Nature and Natural Resources.

Sigler, T. J. (2014). Panama's Special Economic Zones: Balancing Growth and Development. *Bulletin of Latin American Research* (33.1), 1-15.

Siikamäki J, Sanchirico J. N. Jardine S. L. (2012). Global economic potential for reducing carbon dioxide emissions from mangrove loss. *Proceedings of the National Academy of Sciences of the United States of America, 109*(36), 14369-14374.

Visit Us at Galeta – History. (n.d.). *Smithsonian Tropical Research Institute*. Retrieved from https://www.stri.si.edu/english/visit_us/galeta/history.php (20 Apr. 2014)

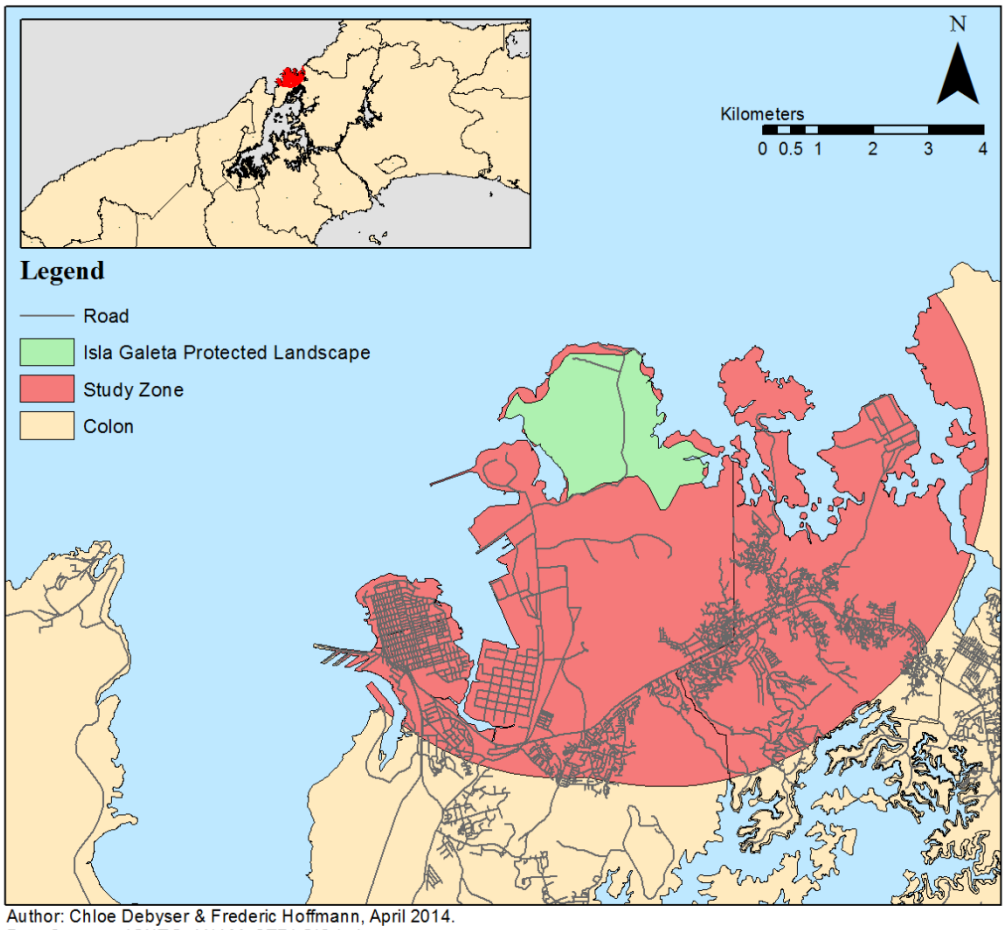
Twilley, R. R. Chen R. H. Hargis T. (1992). Carbon sinks in mangroves and their implications to carbon budget of tropical coastal ecosystems. *Water Air Soil Pollut Water, Air, & Soil Pollution, 64*(1-2), 265-288.

2012 Investment Climate Statement - Panamá. (2012, June) *U.S. Department of State*. Retrieved from http://www.state.gov/e/eb/rls/othr/ics/2012/191215.htm (20 Apr. 2014)

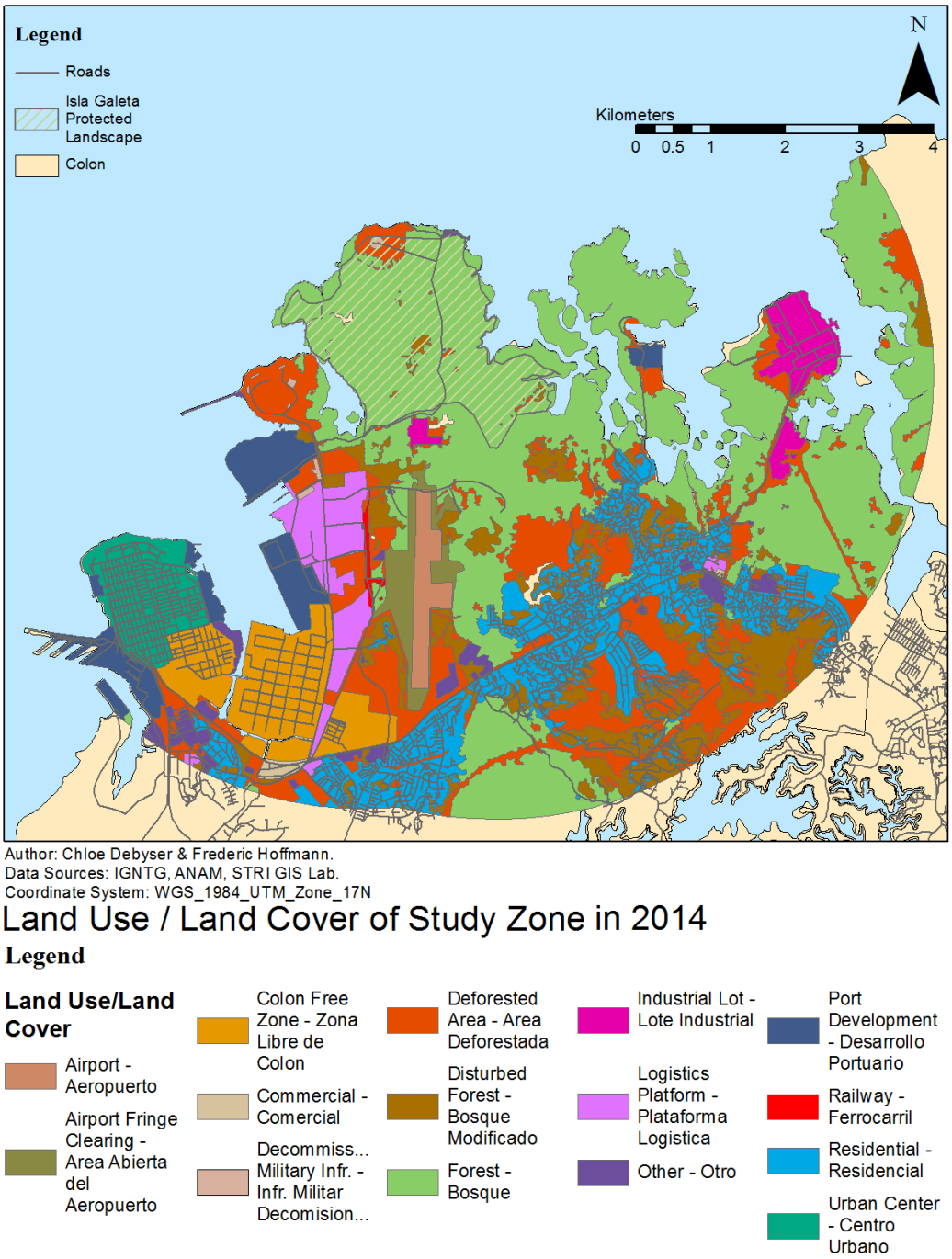
APPENDICES

Appendix I – Figures

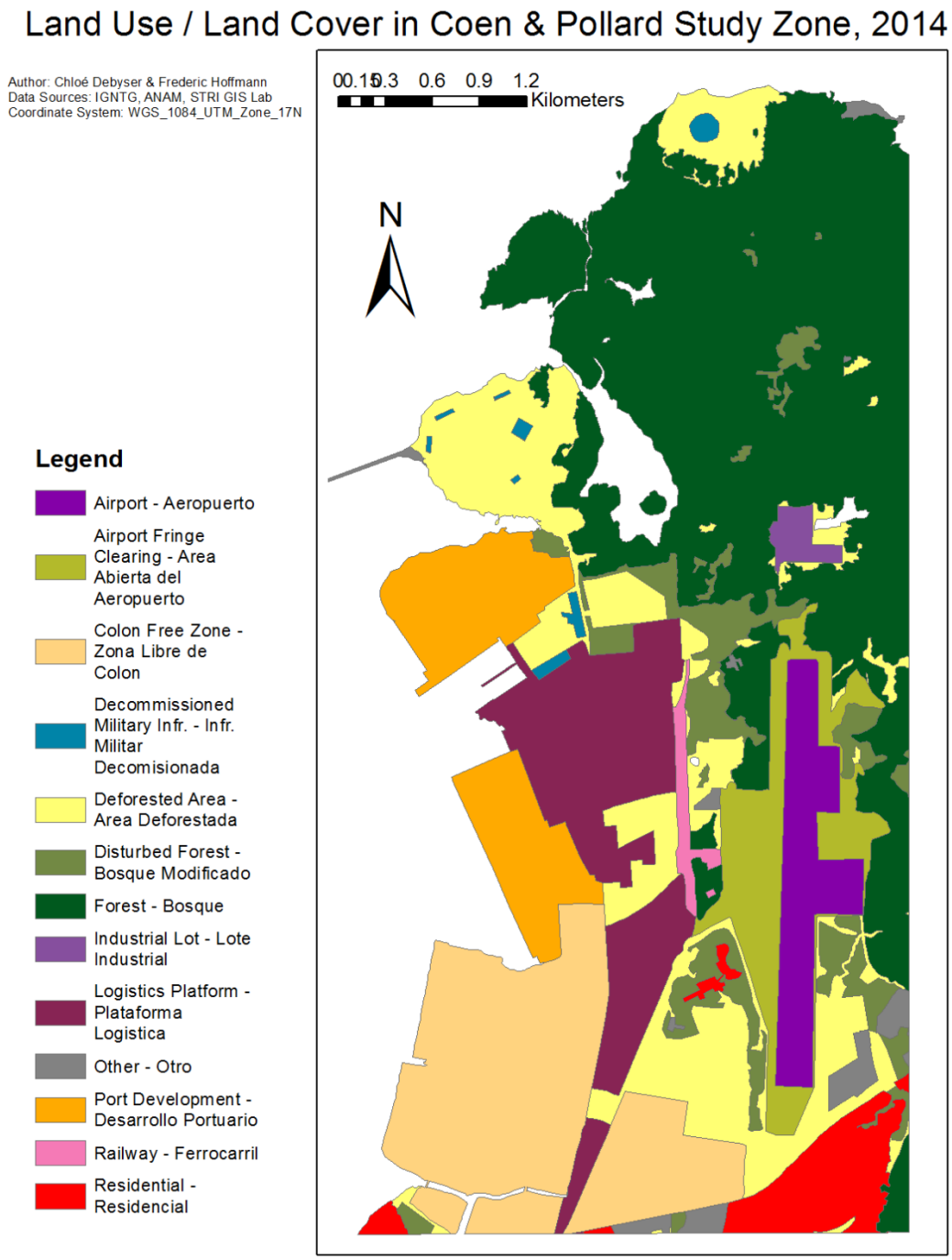
I.I – Maps



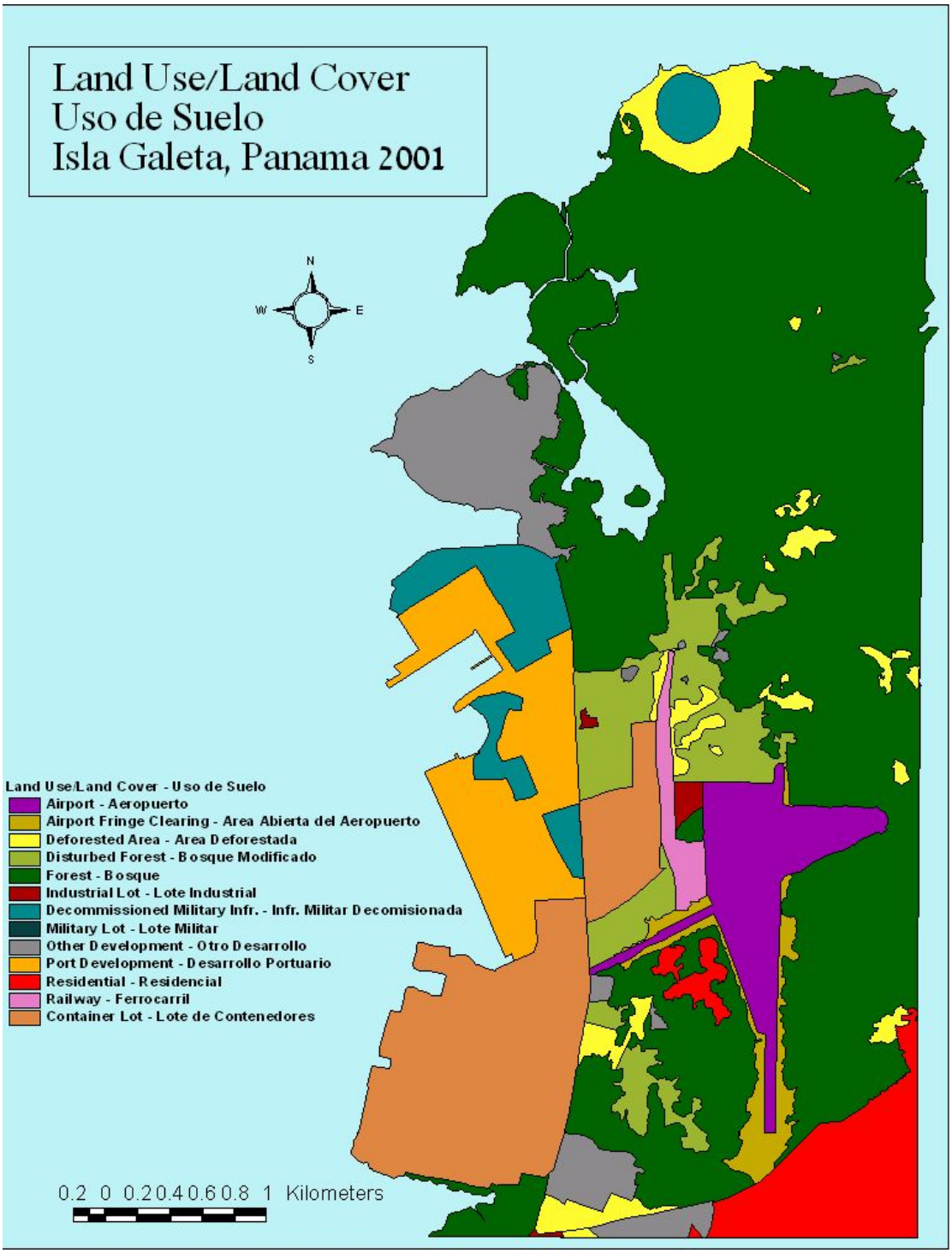
Map 1. Study Zone



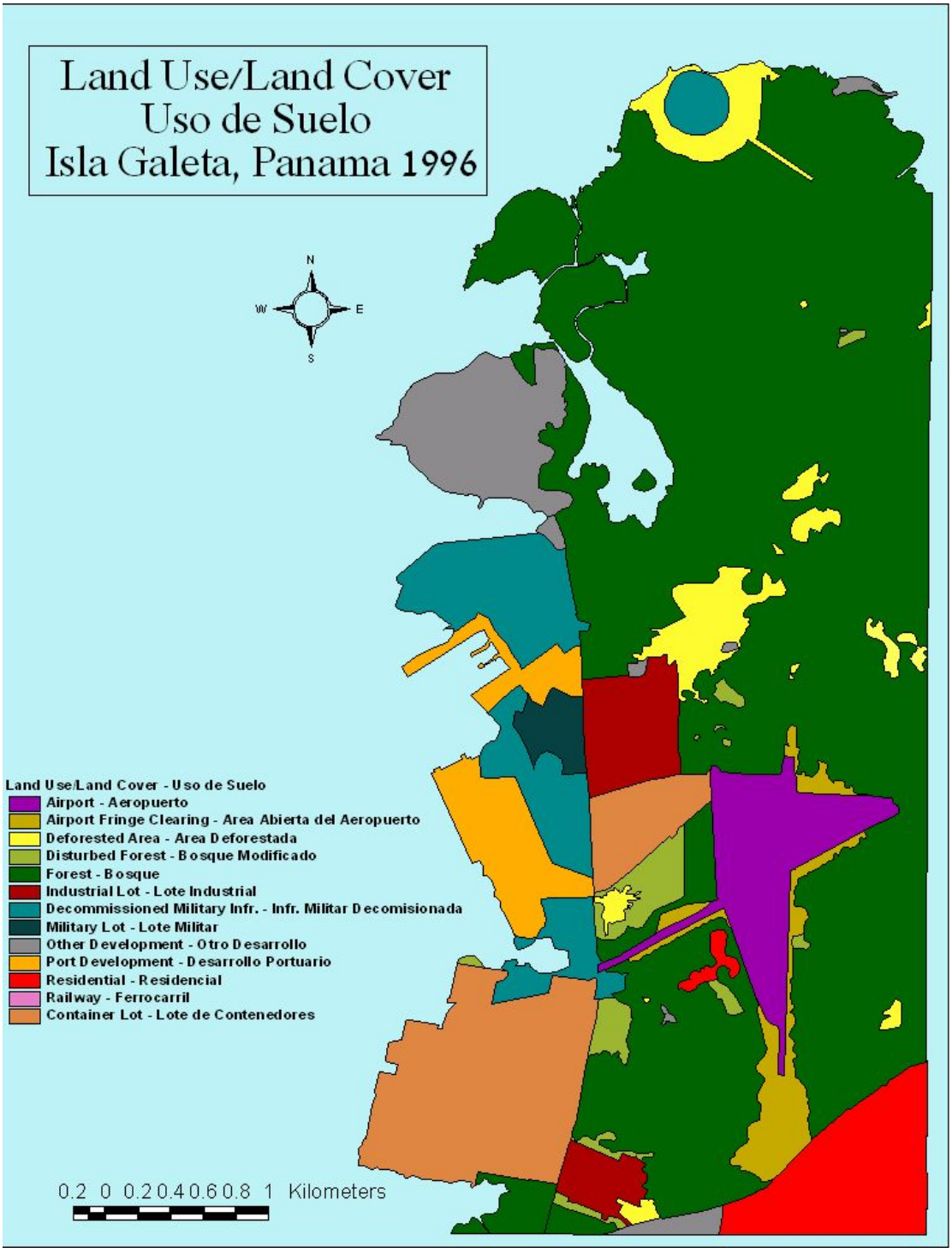
Map 2. Land Use / Land Cover of Study Zone in 2014



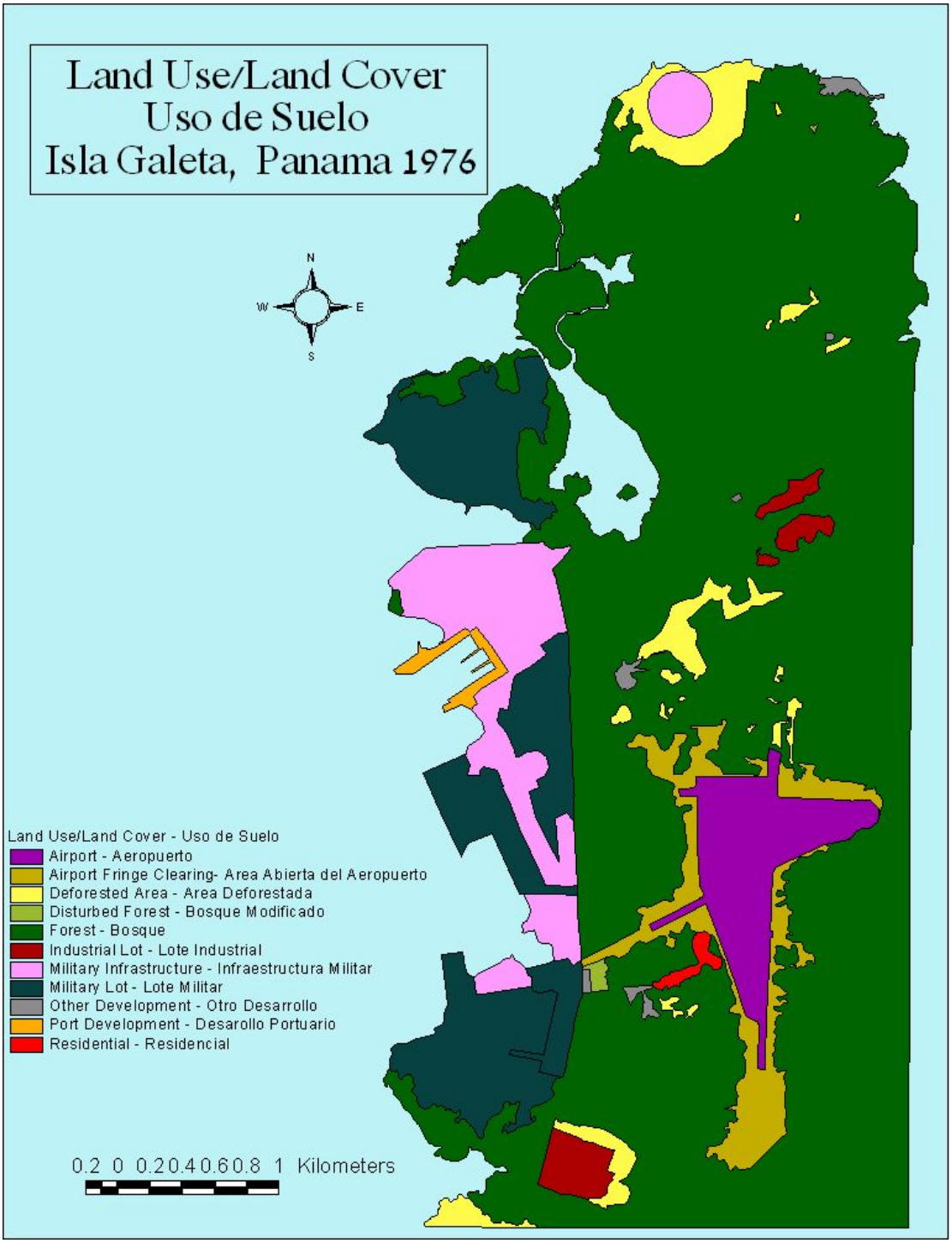
Map 3. Land Use / Land Cover in Coen & Pollard's Study Zone, in 2014



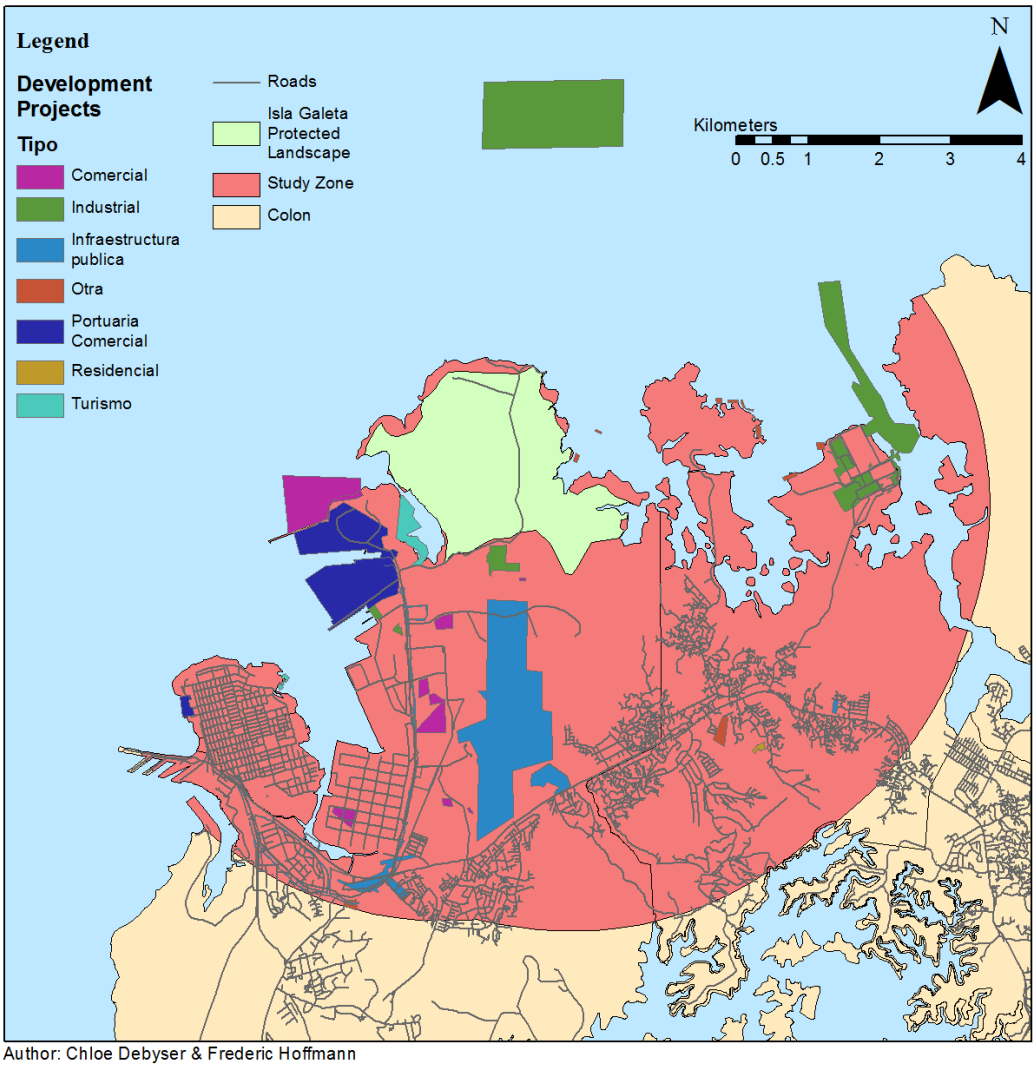
Map 4. Land Use / Land Cover near Isla Galeta, 2001 (Coen & Pollard, 2003)



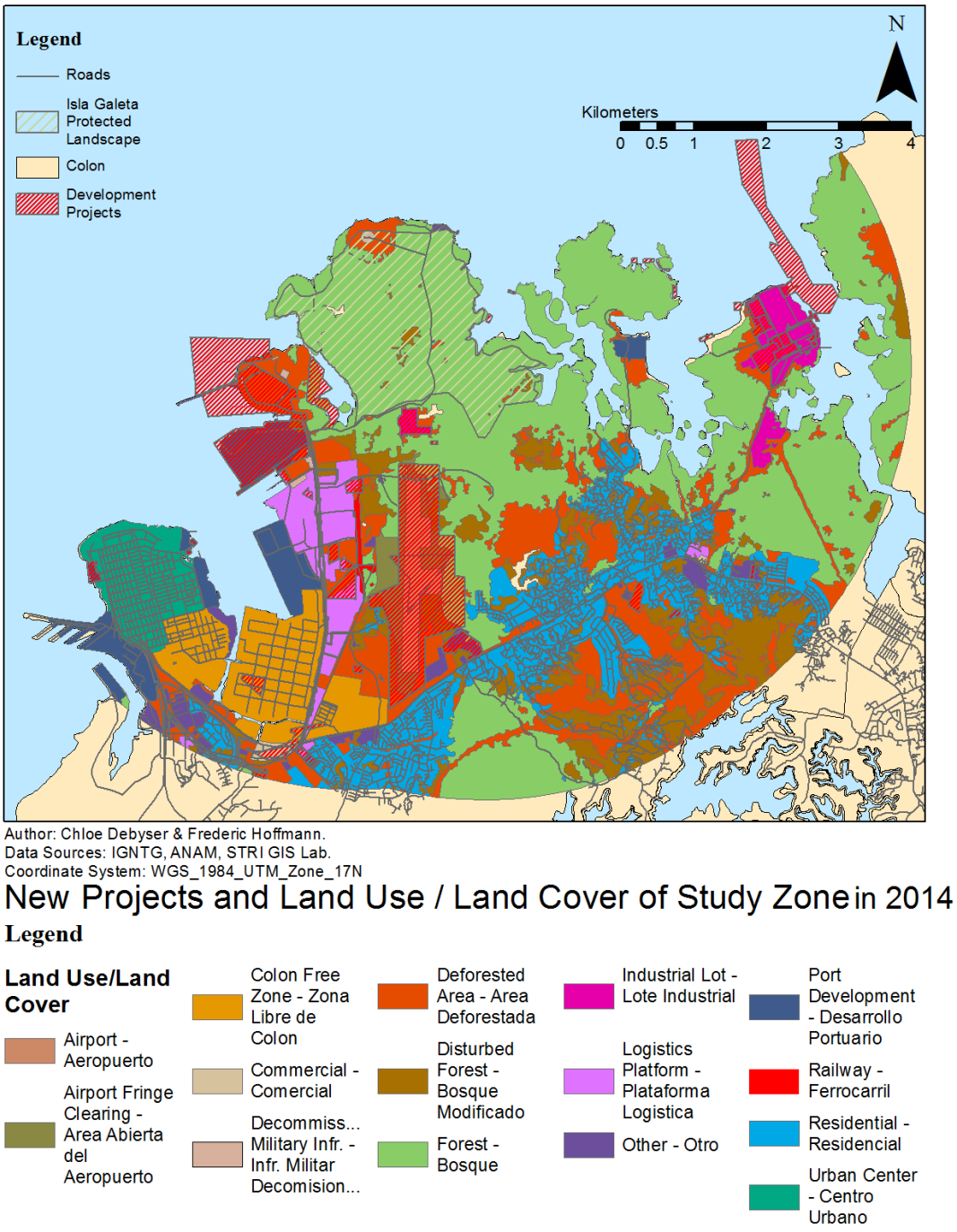
Map 5. Land Use / Land Cover near Isla Galeta, 1996 (Coen & Pollard 2003)



Map 6. Land Use / Land Cover near Isla Galeta, 1976 (Coen & Pollard 2003)



Map 7. Projects Approved by ANAM in 2010-2013, in Study Zone



Map 8. New Projects and Land Use / Land Cover of Study Zone in 2014

I.II – Charts

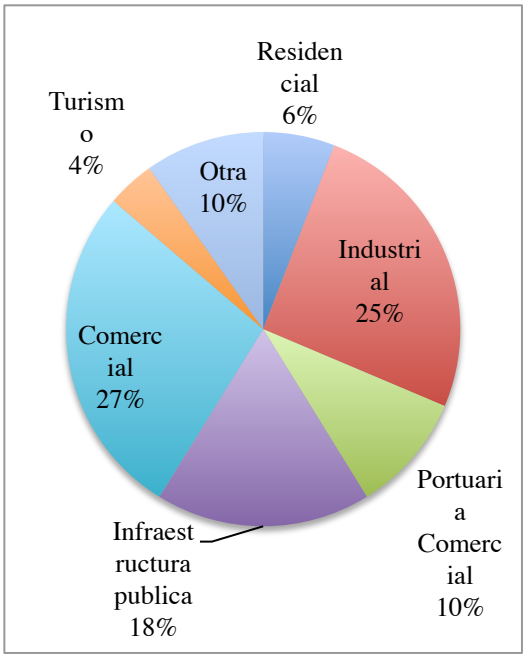


fig.1a. Projects by Type

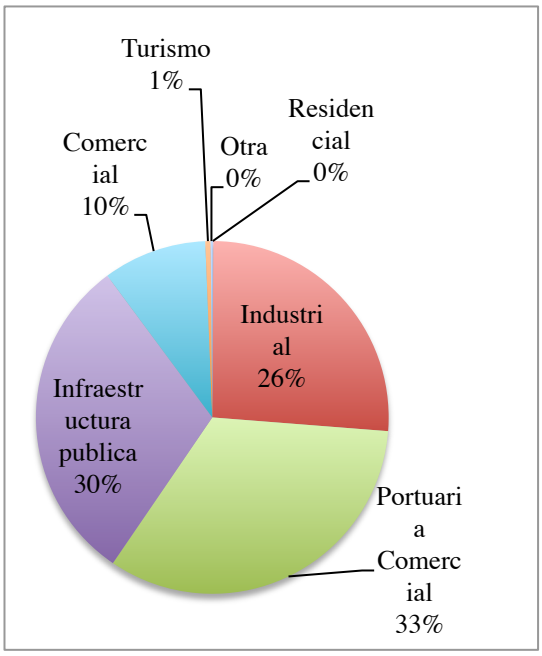


fig. 1b: Investment by Project Type

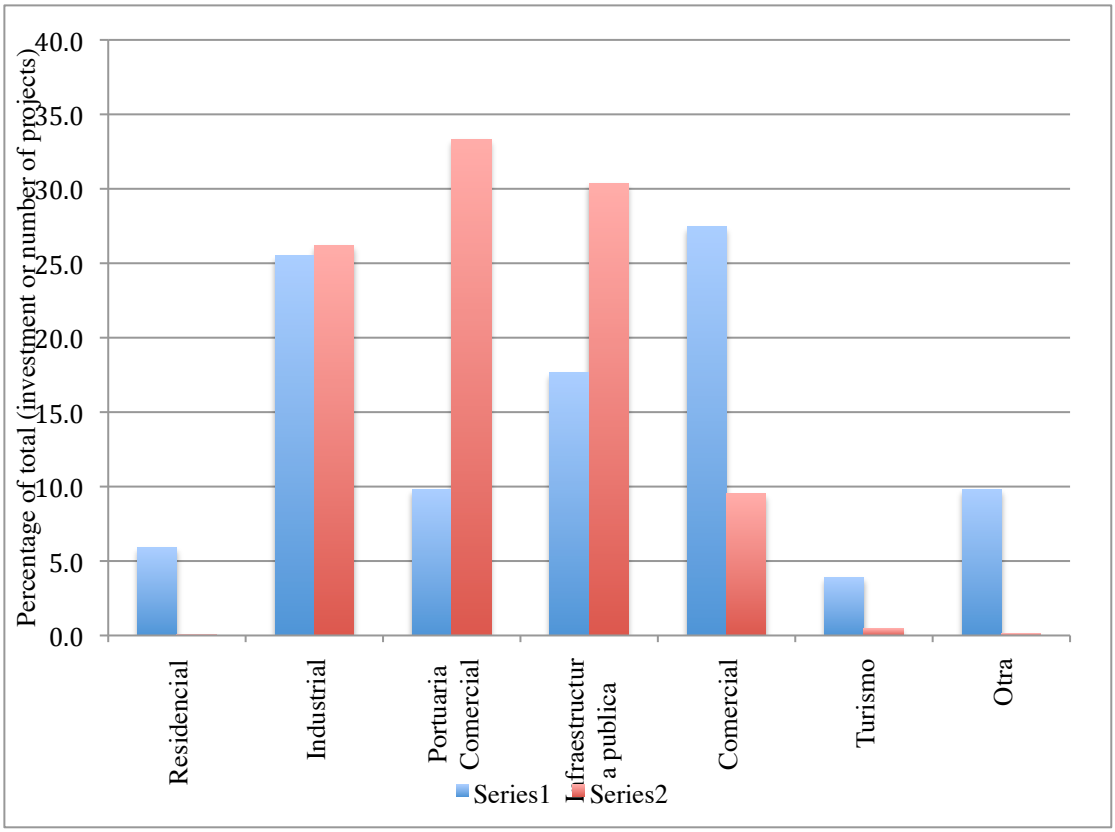
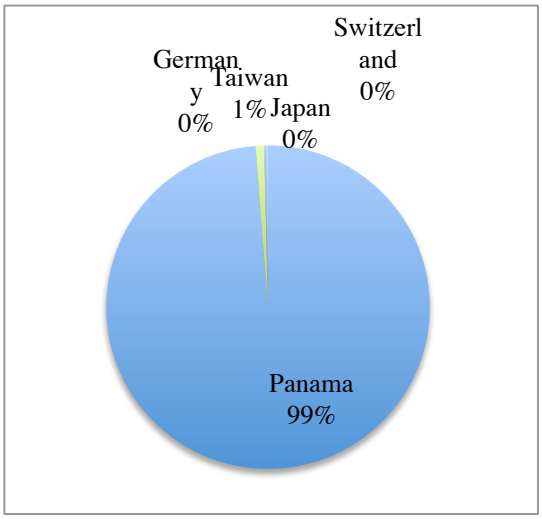


fig. 1c: share of investment by type and value



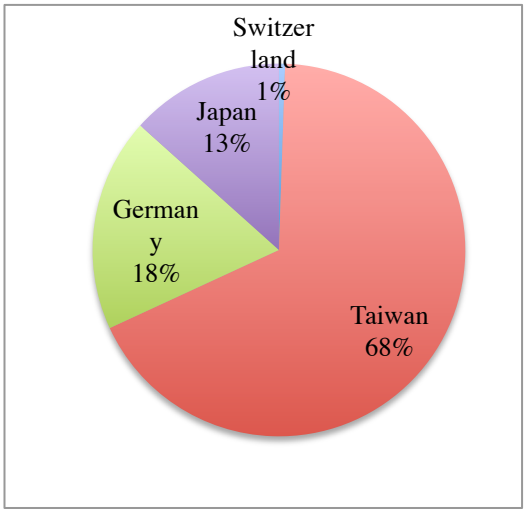


fig. 2a (above, left): share of investment by country of origin

fig. 2b (above, right): share of investment by country of origin, excluding Panamá

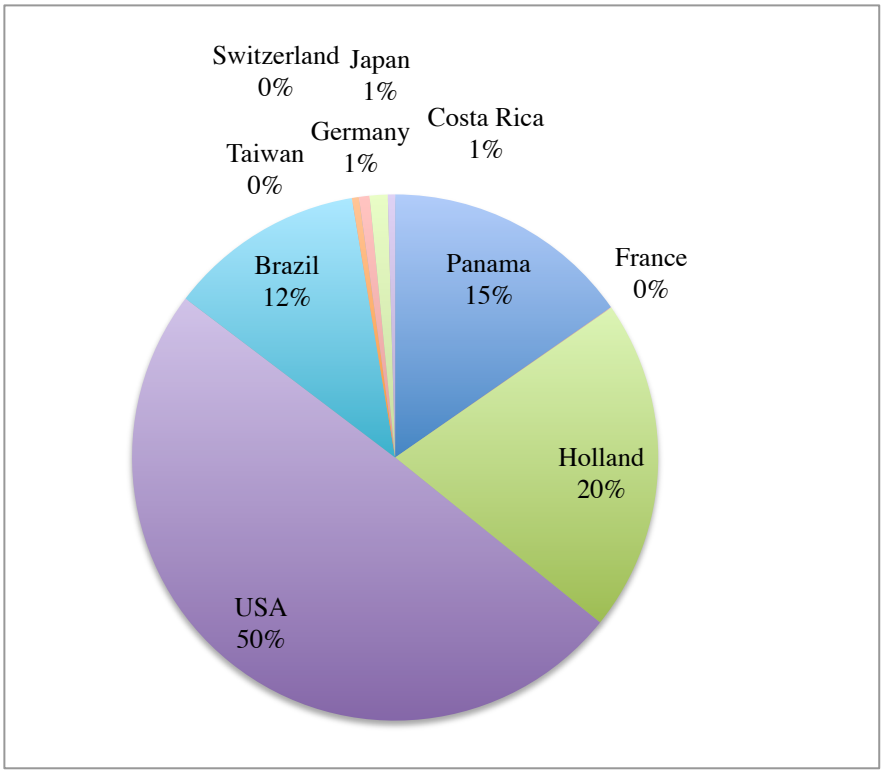


fig. 3: investment by country of highest traceable owner of local prospector

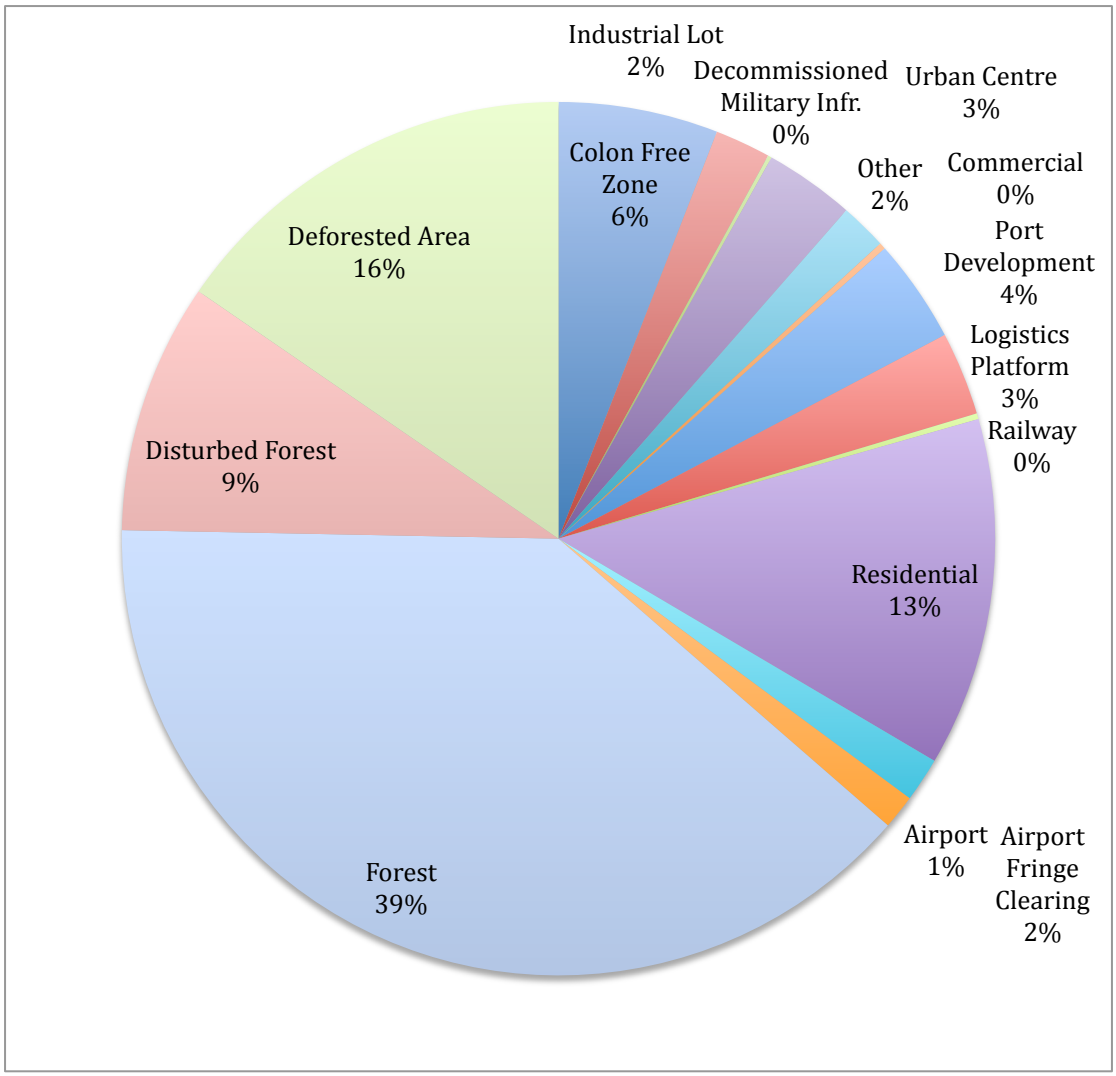


fig. 4. Relative Proportion of Land Use and Land Cover Classes

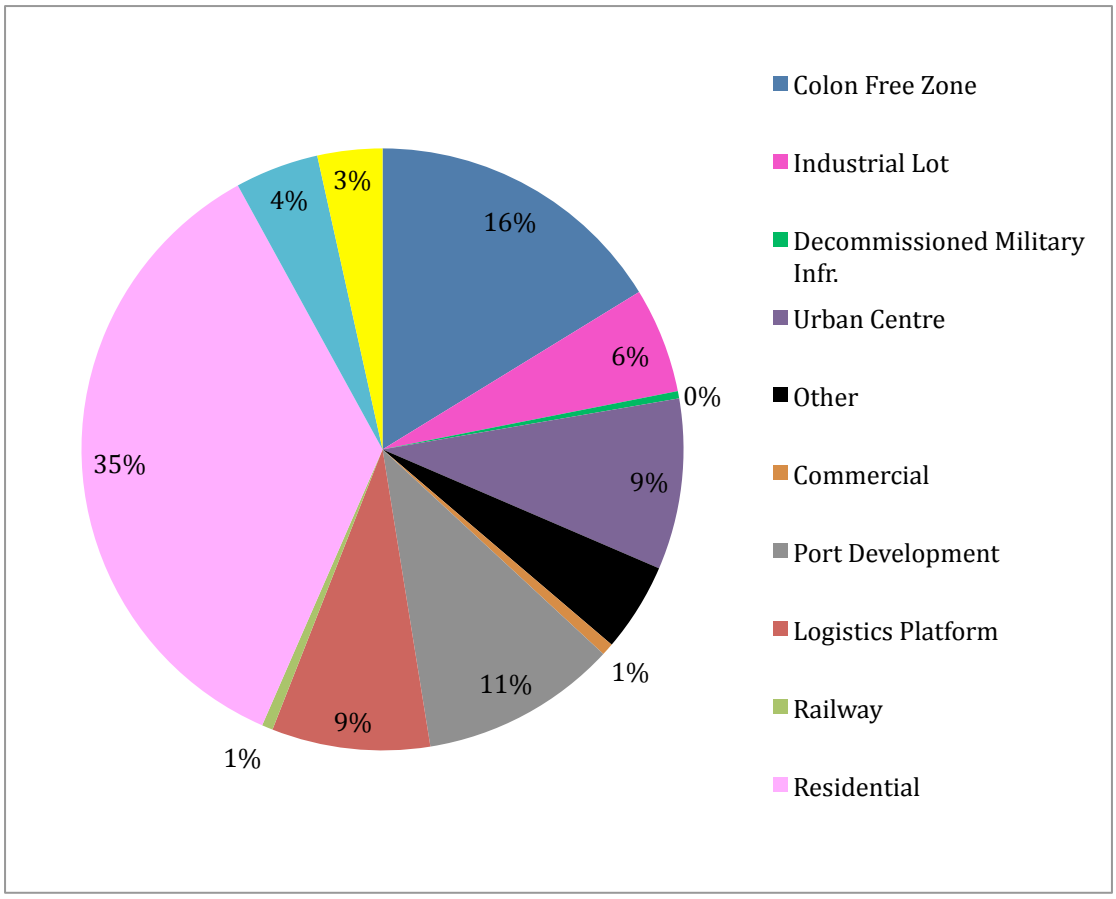


fig. 5. Relative Proportion of Constructed Land Use Classes

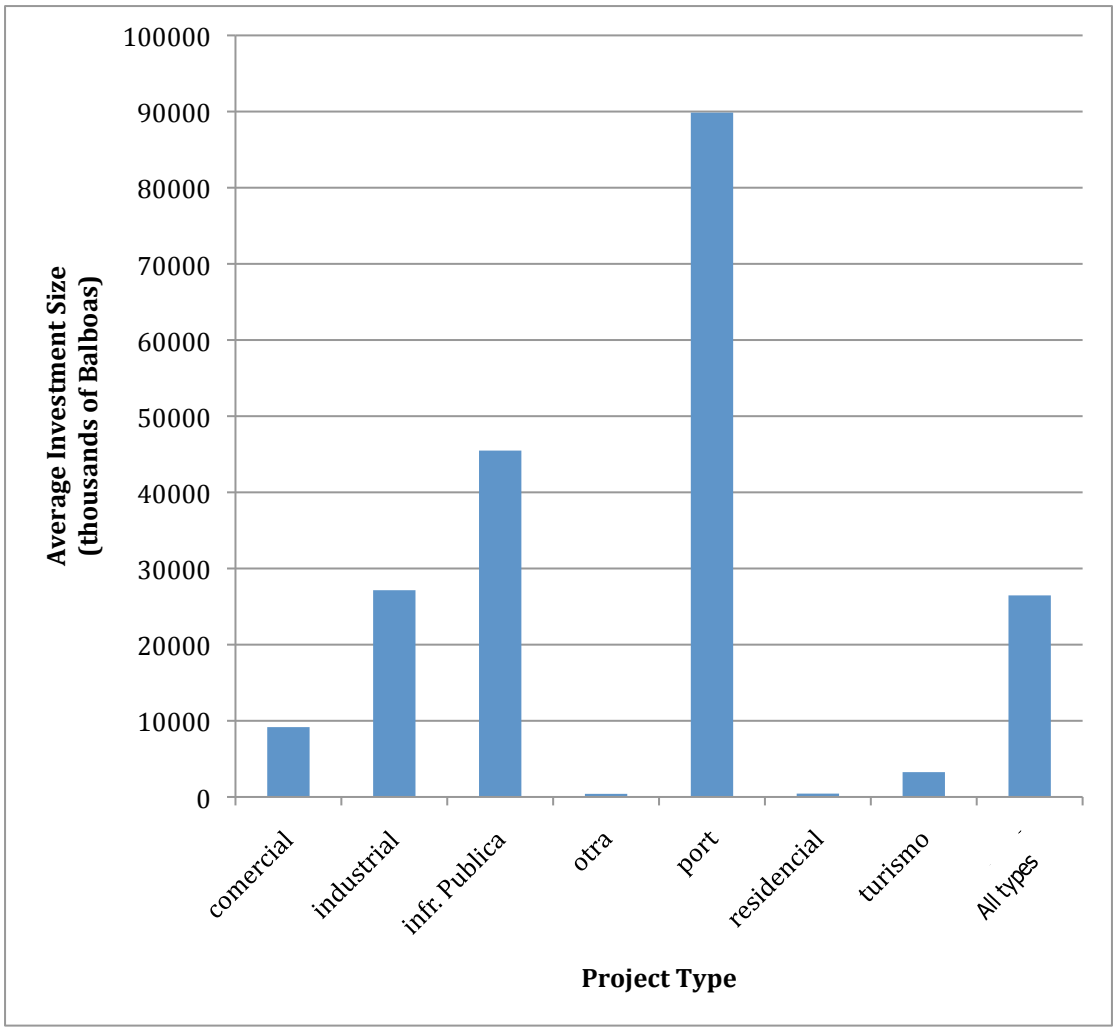
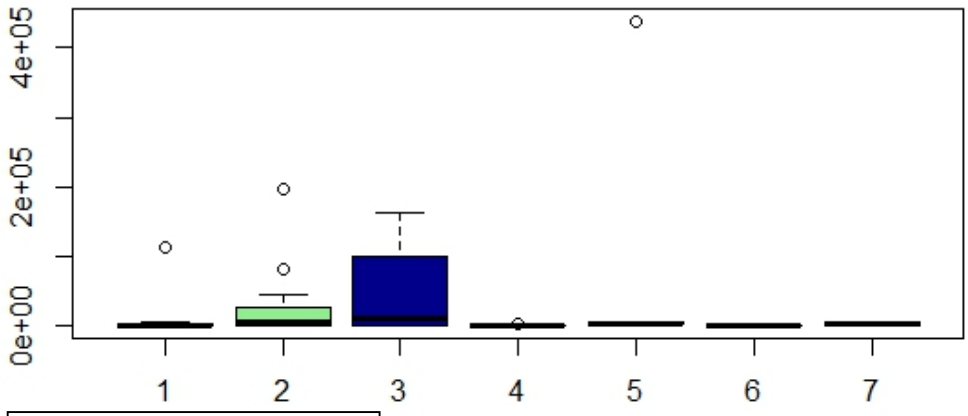


fig. 6. Average Investment Size per Project Type



Legend:

1 – Commerce

2 – Industrial

3 – Public Infrastructure

4 – Other

5 – Commercial Port

6 – Residential

7 - Tourism

fig. 7. Boxplots for the Investment Values of Each Project Type

I.III – Diagrammatic representations

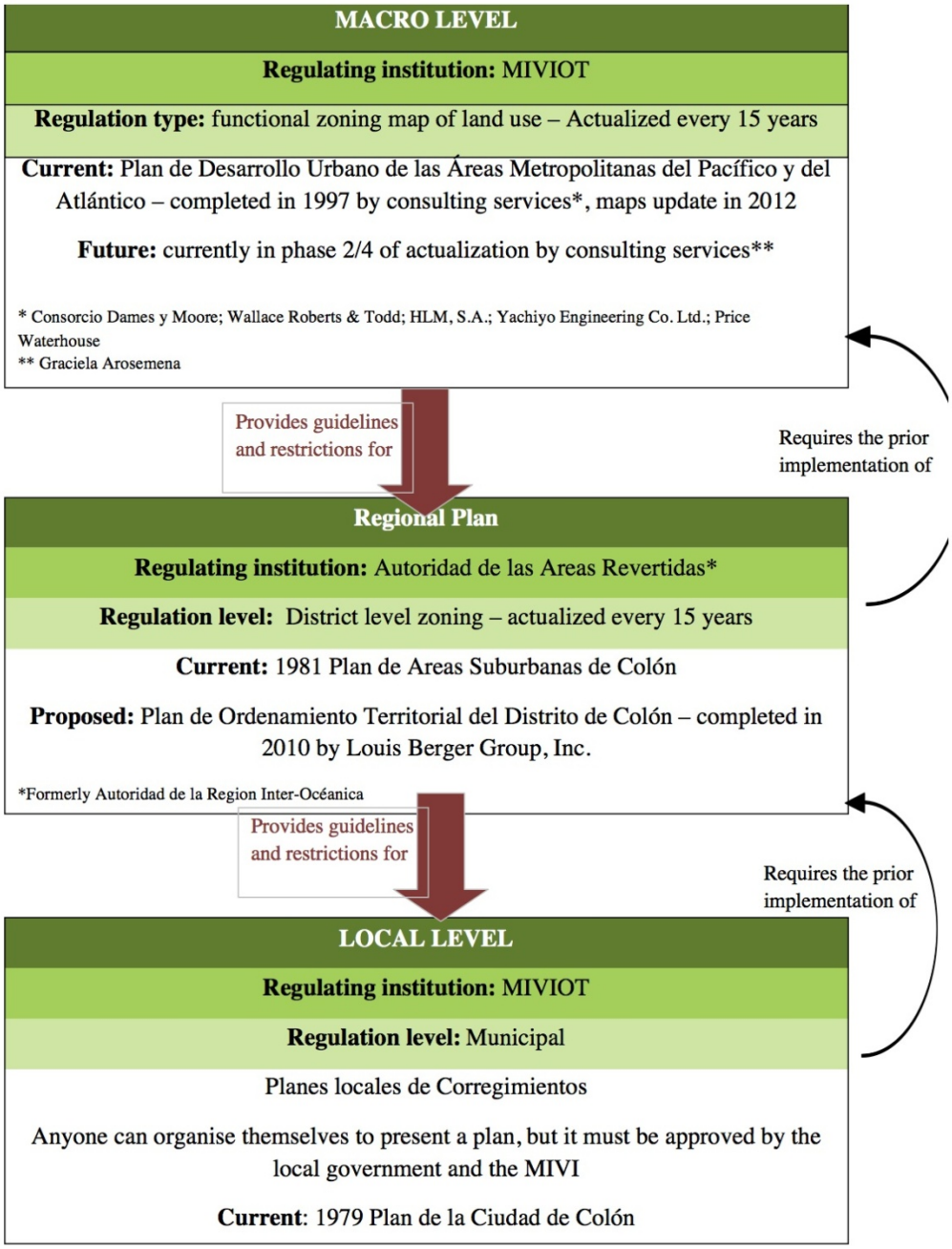


Diagram 1. Hierarchy of land use regulations and feedbacks of reliance

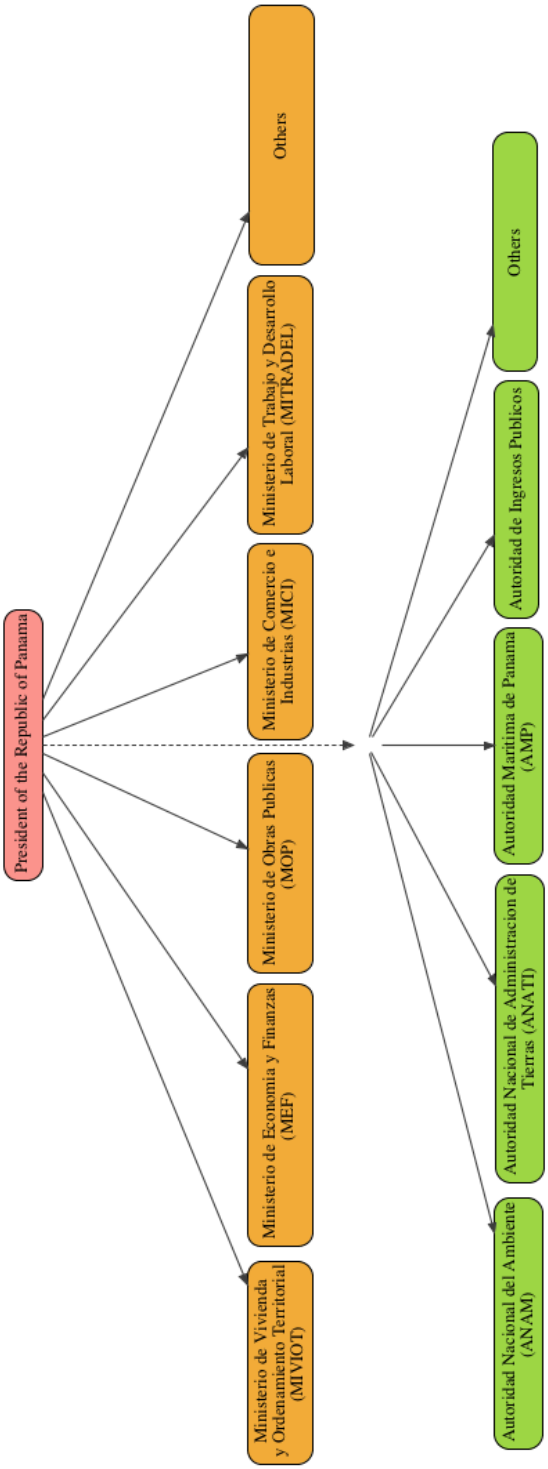


Diagram 2. Governmental structure

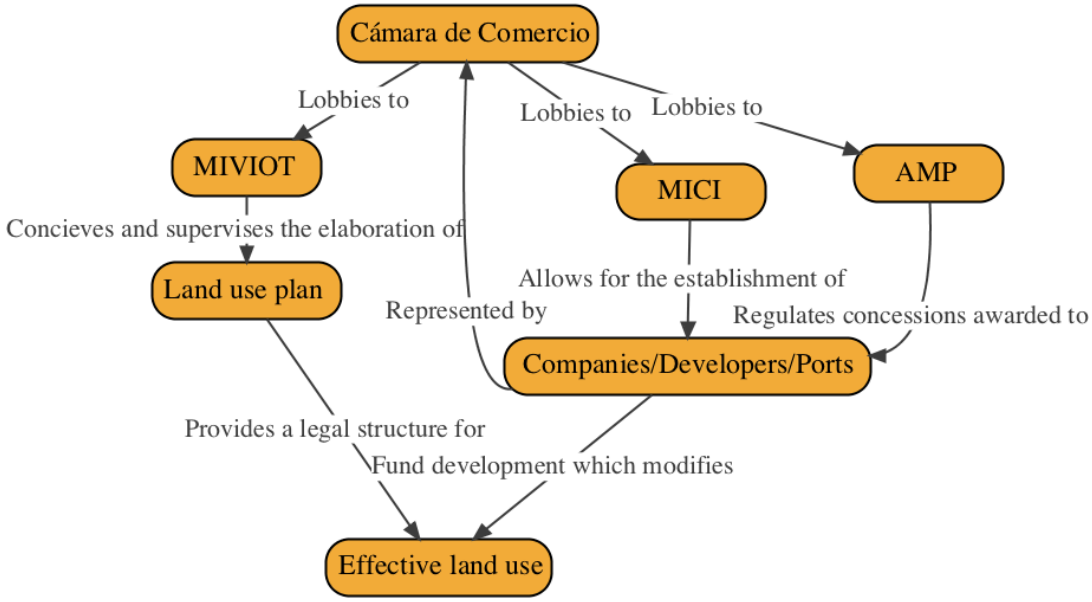


Diagram 3. Authority web in efficient land use planning

I.IV – Tables

Land Use and Land Cover Category	Definition
Airport	Constructed area covered by airport infrastructure (runway, terminal...)
Airport Fringe Clearing	Non-forested and non-constructed area around the airport, which allows for plane manoeuvring
Colon Free Zone	Constructed area covered by the Colon Free Zone, as defined by Panamanian legislation
Commercial	Constructed area used for commercial purposes, excluding the Colon Free Zone
Decommissioned Military Infr.	Constructed area previously allocated to U.S. military operations and reverted to the Panamanian government
Deforested Area	Area largely deprived of trees and not covered by construction
Disturbed Forest	Area largely covered in trees and appearing to be regenerating from or currently undergoing human alterations
Forest	Area largely covered in trees that form a primary forest or a fully grown secondary forest
Industrial Lot	Constructed area allocated to industrial activities
Logistics Platform	Constructed area allocated to storage, packaging, small manufacturing and / or acting as a platform for road

	transportation
Other	Constructed area of which the use does not fall within any of the other categories (schools, hospitals, recreational areas...)
Port Development	Constructed area where marine traffic is received and cargo is directly loaded / unloaded
Railway	Constructed area used for railway transportation and surrounding infrastructure
Residential	Constructed area largely allocated to housing, may include some scattered other uses such as local shops
Urban Center	Constructed area in which housing units, shops, urban green space, recreational areas and administrative buildings come together in highly spatially intertwined way

Table 1. Land use and land cover classification

Land Use / Land Cover Category	Surface Area (m^2)	Portion of total area (%)
Colon Free Zone	3440000	5.9
Industrial Lot	1198000	2.1
Decommissioned Military Infr.	83000	0.1
Urban Centre	1944000	3.3
Other	1010000	1.7
Commercial	140000	0.2
Port Development	2238000	3.8
Logistics Platform	1801000	3.1
Railway	125000	0.2
Residential	7513000	12.9
Airport Fringe Clearing	953000	1.6
Airport	738000	1.3
Forest	22644000	38.9
Disturbed forest	5395000	9.3
Deforested area	8972000	15.4
TOTAL AREA	58194000	100

Table 2. Absolute and Relative Surface Area of each Land Use / Land Cover Category

Land Use / Land Cover Category	Surface Area in 2014 (m2)	Percentage of Total Area in 2014	Surface Area in 2001 (m2)	Percentage of Total Area in 2001	Point Increase / Decrease in the Percentage of Total Area between 2001 and 2014
Deforested Area	2847926.254	14.92236945	733156.75	3.582021618	11.34034783
Disturbed Forest	1084854.029	5.684344035	1182390.56	5.776866334	-0.092522298
Forest	6717259.835	35.19663925	10278464.82	50.21802388	-15.02138463
Constructed Area	8434906.568	44.19664727	8273668.646	40.42308817	3.773559102
Total Area	19084946.69	100	20467680.78	100	0

Table 3. Point Increase / Decrease in the Percentage of Total Area covered by different Land Use/Land Cover categories between 2001 and 2014, in the Coen & Pollard (2003) study zone

Appendix II – Legal Texts

Capitulo 7° del Titulo III de la Constitución de Panamá: Régimen Ecológico

Artículo 118. Es deber fundamental del Estado garantizar que la población viva en un ambiente sano y libre de contaminación, en donde el aire, el agua y los alimentos satisfagan los requerimientos del desarrollo adecuado de la vida humana.

Artículo 119. El Estado y todos los habitantes del territorio nacional tienen el deber de propiciar un desarrollo social y económico que prevenga la contaminación del ambiente, mantenga el equilibrio ecológico y evite la destrucción de los ecosistemas.

Artículo120. El Estado reglamentará, fiscalizará y aplicará oportunamente las medidas necesarias para garantizar que la utilización y el aprovechamiento de la fauna terrestre, fluvial y marina, así como de los bosques, tierras y aguas, se lleven a cabo

racionalmente, de manera que se evite su depredación y se asegure su preservación, renovación y permanencia.

Artículo 121. La Ley reglamentará el aprovechamiento de los recursos naturales no renovables, a fin de evitar que del mismo se deriven perjuicios sociales, económicos y ambientales.

Capitulo II del Titulo IV de la Ley 41 de 1998

Artículo 23. Las actividades, obras o proyectos, públicos o privados, que por su naturaleza, características, efectos, ubicación o recursos pueden generar riesgo ambiental, requerirán de un estudio de impacto ambiental previo al inicio de su ejecución, de acuerdo con la reglamentación de la presente Ley. Estas actividades, obras o proyectos, deberán someterse a un proceso de evaluación de impacto ambiental, inclusive aquellos que se realicen en la cuenca del Canal y comarcas indígenas.

Artículo 24. El proceso de evaluación del estudio de impacto ambiental comprende las siguientes etapas:

1. La presentación, ante la Autoridad Nacional del Ambiente, de un estudio de impacto ambiental, según se trate de actividades, obras o proyectos, contenidos en la lista taxativa de la reglamentación de la presente Ley.

2. La evaluación del estudio de impacto ambiental y la aprobación, en su caso, por la

Autoridad Nacional del Ambiente, del estudio presentado.

3. El seguimiento, control, fiscalización y evaluación de la ejecución del Programa de Adecuación y Manejo Ambiental (PAMA) y de la resolución de aprobación.

Artículo 25. El contenido del estudio de impacto ambiental será definido por la Autoridad Nacional del Ambiente, en coordinación con las autoridades competentes, y publicado en el manual de procedimiento respectivo.

Artículo 26. Los estudios de impacto ambiental serán elaborados por personas idóneas, naturales o jurídicas, independientes de la empresa promotora de la actividad, obra o proyecto, debidamente certificadas por la Autoridad Nacional del Ambiente.

Artículo 27. La Autoridad Nacional del Ambiente hará de conocimiento público la presentación de los estudios de impacto ambiental, para su consideración, y otorgará un plazo para los comentarios sobre la actividad, obra o proyecto propuesto, que será establecido en la reglamentación de acuerdo con la complejidad del proyecto, obra o actividad.

Artículo 28. Para toda actividad, obra o proyecto del Estado que, de acuerdo con esta Ley y sus reglamentos, requiera un estudio de impacto ambiental, la institución pública promotora estará obligada a incluir, en su presupuesto, los recursos para cumplir con la obligación de elaborarlo y asumir el costo que demande el cumplimiento del Programa de Adecuación y Manejo Ambiental.

Artículo 29. Una vez recibido el estudio de impacto ambiental, la Autoridad Nacional del Ambiente procederá a su análisis, aprobación o rechazo. El término para cumplir, ampliar y presentar los estudios de impacto ambiental, será establecido mediante reglamentación de la presente Ley.

Artículo 30. Por el incumplimiento en la presentación o ejecución del estudio de impacto ambiental, la Autoridad Nacional del Ambiente podrá paralizar las actividades del proyecto eimponer sanciones según corresponda.

Artículo 31. Contra las decisiones del Consejo Nacional del Ambiente o de la Autoridad Nacional del Ambiente, en cada caso de su competencia, se podrá interponer el recurso de reconsideración, que agota la vía gubernativa.

Appendix III – Template of Semi-Structured Interviews

1. General Information on interviewee

Name:

Organization:

Position:

Duration in position:

[Place of interview: ……...]

[Date: ……...]

1. What is your job, your position within the company or department, your responsibilities?
2. What is the mission of your organisation with regards to project development around Colón?
3. Is it fulfilling this? how successful is this organisation?
4. Why is it not more successful, what are the difficulties you face as an organisation?
5. How is your organisation doing financially? Who finances you? Are there chronic financial problems?
6. What is the internal structure of your organisation?
7. Is it efficient? Does it affect its mission?

8. What are the other major players in mega project development around Colón, and how do you interact with them? Do you wish this happened differently?

9. Do you think the legal framework and larger governing institutions play a helpful role towards your mission? Do you wish the legal structure or your level of political independence were different?

10. Identify factors responsible for success and rate of Colón's development.

11. What is the process that a developer has to go through in order to open business in Colón? How do the different players outlined above interact / divide labour throughout this process? Does it differ for Panamanian and foreign prospectors?

12. Is this appropriate? Does it limit or encourage development?

13. Is this process fully and systematically followed, or is it often by-passed? How so? Imply foul play, but don't mention it. Gauge the atmosphere.

14. What is your vision for your organisation's work in Colón in the coming decades? What should be changed?

15. Who else do you suggest we talk to? Is there anyone else whose voice should be heard in this study?

<u>2 – Theme 1: Why port / industrial development around Colón?</u>

1. Why are they investing in Colón?

2. Please pick the factors most critical in attracting companies to Colón

Availability of land

Weak political institutions

Corruption

Presence of the Free Zone

Proximity to Canal

Cheap labour

Educated labour

Encouraging legislation

Global economic situation

Richness of natural resources

Existing infrastructure

People's will

3. Are there any factors that you think are important and absent from our list?

4. Please justify the factors that you picked.

3 – Theme 2: Why so is this so successful and fast-paced?

6. Development initiatives have been fairly successful around Colón... Why is that?

7. What are the different steps that bring a company's project from conception to completion? Is this an appropriate process?

8. Do you feel that foul play often enters this process? If so, of what kind and have you witnessed it?

9. Do you feel that urban planners and Colón administration are in control of land use around Colón? Why?

10. Do you feel that people who might be opposed to this trend are able to express themselves? Why?

4 – Theme 3: Why is info not readily available?

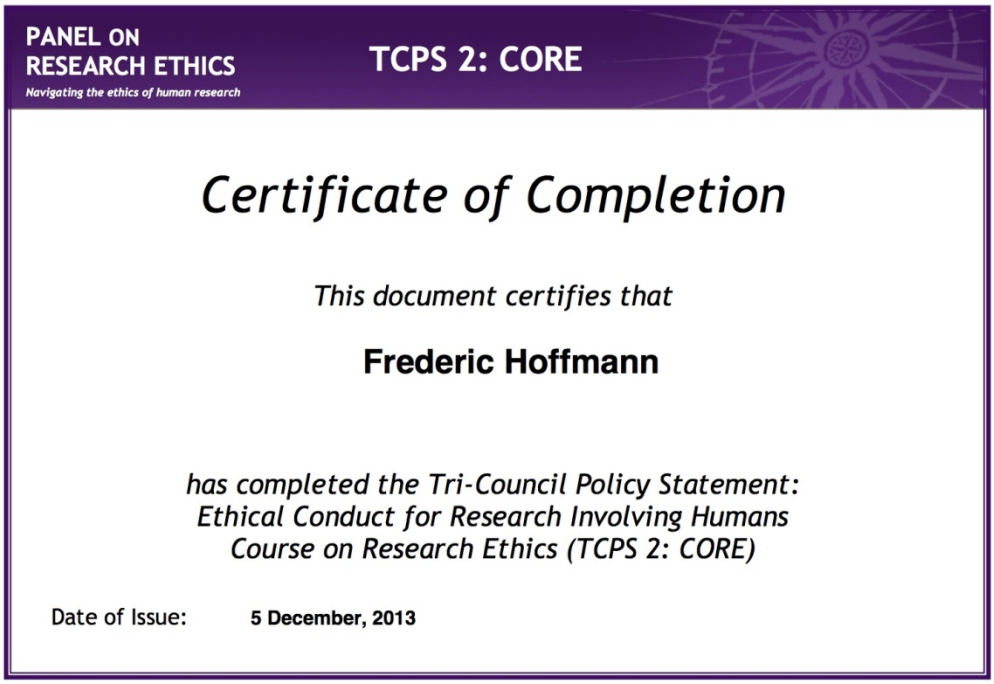
11. Do you feel that the people of Colón are well informed about new and upcoming projects? If not, why? What are their sources of info?

12. As a *insert job title*, do you feel that you are well informed? Where do you get your information from?

13. As a *insert job title*, what are your obligations in terms of providing information to the public? Do you think this is sufficient to give locals the opportunity to speak up against projects they may find inconvenient?

14. Do you have any recommendations or wishes for making the public more informed and empowered to decide the fate of land use around Colón?

Appendix IV – Proof of completion of TCPS 2: CORE Course



PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

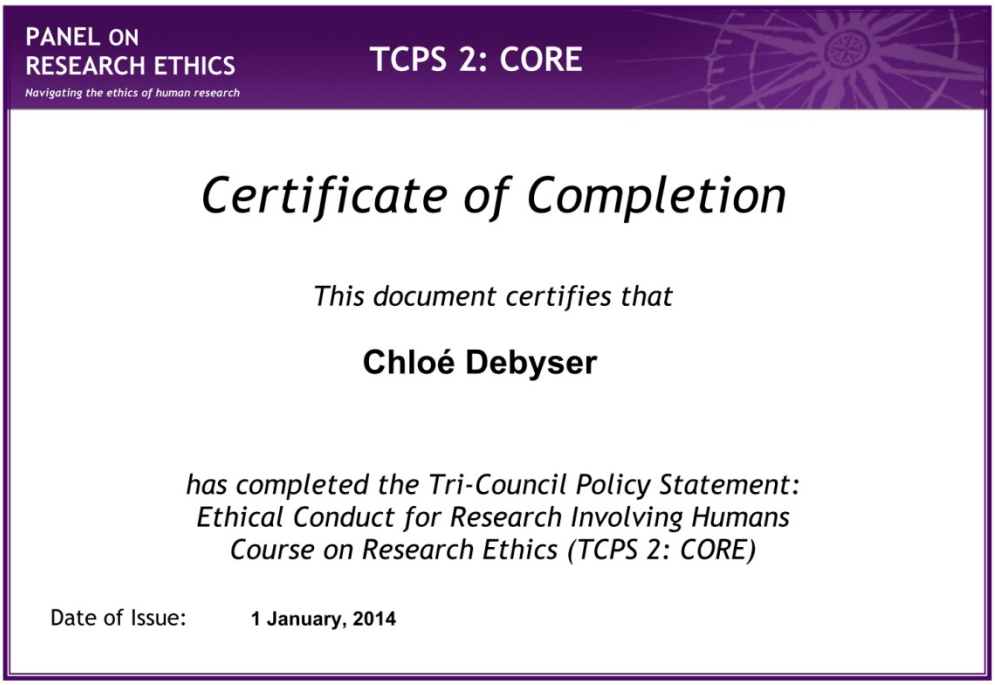
Certificate of Completion

This document certifies that

Frederic Hoffmann

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: **5 December, 2013**



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Date of Issue: **1 January, 2014**

Appendix V – Research Calendar

	Background Research	Data Collection	Map Making	Database Building	Interviews	Final report writing
January						
February						
March						
April						

Appendix VI

Puerto Verde

The *Gaceta Oficial*, charged with reporting official government resolutions, published on the 8th April 2014 that the Council of the Cabinet of the Republic of Panamá had authorized the sale of a large expanse of mangrove to SMC Barcelona, S.A., to the tune of 30 million balboas ("Resolucion de Gabinete N°59", 2014). This authorisation was given despite little being known about SMA Barcelona, S.A. (other than that it is a private port developer), or where their financial backing comes from. They have been given the right to develop, construct and operate a project with a predicted 7.9 billion balboa investment, and creating almost 9000 jobs ("Resolucion de Gabinete N°59", 2014:5). The construction area covers almost 127 hectares on Isla Largo Remo, and all that is needed for construction to begin is approval of the EIA submitted to ANAM (currently in the public consultation phase), and the obtention of a change in land zoning through the MIVIOT ("Resolucion de Gabinete N°59", 2014:8). Signed by the President of the Republic, Ricardo Martinelli, and his

ministers, this Resolution marks the central government's will to further development in the area of Colón, and gives an indication of the momentum behind this project.

Picked up by the press six days later, La Prensa published two articles by Ohigginis Jaramillo depicting the scope and impacts of the proposed "Puerto Verde" mega-port-project (Jaramillo, 2014A, Jaramillo, 2014B). The planned port will lead to the construction of a new road, a rail road, a water treatment plant, and a solid waste treatment plant along with vast port and storage infrastructure (Jaramillo, 2014B). Further, this project will directly impact 153 hectares of mangrove, which represents 10% of Colón's total mangrove area, and will cover 432 hectares of land and 225 hectares of sea (Jaramillo, 2014B). Needless to say, environmental rights groups are very concerned.

In December 2013, the Centro de Incidencia Ambiental (CIAM) published a commentary on Puerto Verde's EIA. In this report, eleven major shortcomings of the EIA are outlined. It concludes that the EIA does not offer a sufficient analysis of potential impacts of the project, be they legal, social, or environmental (Arosemena & Ramos, 2013), and therefore recommends it be rejected in its entirety.

Plan de Ordenamiento Territorial del Distrito de Colon

The Louis Berger Group was commissioned to produce recommendation for a development plan for the area of Colón. The result was the 2010 *Plan de Ordenamiento Territorial del Distrito de Colón* (POT). The POT consists of a comprehensive report that sets out a master plan for the district's development. It is a necessity for coherent development as, as discussed in the political analysis segment of this paper, the different levels of government have rare occasions to consult each other, and development is undertaken rather independently of other agencies' plans.

The resulting chaos is one of the reasons for the unpredictability of Colón's expansion. A communally planned method, such as proposed by the POT, overcomes this issue. By proposing an extension and upgrade of protected areas in the zone, the POT internalises the environment into Colón's economic boom, all the while committing other, already degraded, lands to development (The Louis Berger Group Inc., 2010). It seeks to simplify and increase the efficiency of the road network by offering alternative access to heavy vehicles and the residents of Colón and its suburbs. Sadly, the final stretch of the Carretera Panamá-Colón has now been completed, ignoring the POT's recommendations and resulting in delays and danger due to traffic.

By including recommendations for zoning, roads and public infrastructure, the POT offers solutions to the problems deepened by the current power relation and hierarchical issues. This centralised and holistic approach integrates all stakeholders into the spatial planning of Colón, something that currently does not occur. Sadly, for reasons described in the political analysis segment of this report, the POT has yet to be adopted.