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Observatory of the dynamics of interactions between societies and environment in the amazon
Sustainability and adaptations to global changes

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1 Introduction

Monitoring and understanding socio-environmental dynamics in the Brazilian Amazon is a challenging task due to the large spectrum of socio-environmental concerns threatening this large territory. In order to monitor such dynamics, interdisciplinary approaches coupling environmental monitoring (mainly based on in-situ or remote sensing data) and socio-economic information are required. In this regard, a special attention is given to the monitoring of changing landscapes since the Amazon holds one of the last pioneer frontier in the world. Its efficient monitoring and mapping are especially required in order to better understand its drivers and promote efficient land use policies.

In this context, WP#3 of the ODYSSEA project joins together Brazilian and European experts from different scientific domains (hydrology, agriculture, climatology, health studies, etc) in order to stimulate interdisciplinary studies on the socio-environmental dynamics in the Brazilian Amazon. As a major result, numerous scientific publications were recently published by international teams involved in WP#3. The present report contains a list of these publications produced under the frame of WP#3 and which are accesible online at : https://odyssea-amazonia.org. This list confirms the potential of the interdisciplinary team to provide a global vision on major environmental issues of concern in the Amazon.

Forests represent the major land cover type in the Amazon. Bugnicourt et al. (2018) implemented an innovative approach based on the textural analysis of Digital Elevation Models using Fourier transformation (Barber and Couteron, 2015) to map landforms at regional scale on the Guiana Shield. By doing so they achieved an important step towards a better characterization and mapping of tropical forests, which is necessary for the implementation of efficient conservation policies. Forests are threatened by deforestation activities and fires. In this regard, Cabral et al. (2018) and Silva et al. (2017) developed a genetic programming algorithm to estimate burned areas in the Amazon based on Landsat data.

Hydrological resources are also dramatically impacted by anthropogenic activities in the Amazon basin. In this regard, whereas the impacts of large dams are widely studied by the scientific community, Arvor et al. (2018) focused on the rapid proliferation of small farm dams in the Southern Amazon (Mato Grosso state). Their results indicate a rapid increase of these small water reservoirs mainly dedicated to crop irrigation and fish farming even after deforestation started decreasing in the mid 2000s.

The destruction of natural resources and especially deforestation are also known to impact climate at global, regional and local scales. While Dubreuil et al. (2017) studied the diversity of climates at national scale between 1961 and 2015, Arvor et al. (2017) focused in the Southern Amazon where they studied the 30-years evolution of the rainy season with PERSIANN data. They concluded for the shortening of the rainy season, what may in turn impact agricultural practices in the region (especially the adoption of double cropping practices).

Agriculture is the main economic activity in the Amazon region. In this regard, Bailly et al. (2016) proposed a novel method to map crops based on MODIS time series. Overall, the on-going processes of agricultural expansion and intensification in the Amazon are questionable from a socio-environmental point-of-view. For this reason, Arvor et al. (2016) and Laurent al al. (2017) first analyzed the historic environmental governance model which mainly promoted development-oriented policies to ensure the progress of the agricultural frontier in the Southern Amazon. This work was then completed by Arvor et al. (2017) who discussed the concept of land use sustainability in the Southern Amazon, identifying the recent progress and the challenges ahead.

In addition, results on environmental dynamics were crossed with socio-environmental indicators in order to understand how the environmental changes affect life conditions in the Amazon. In this regard, Tritsch and Arvor (2016) evidenced the emergence of a new pattern of relationship between socio-economic development and deforestation in the Amazon between 2000 and 2010. In their study based on census data and deforestation data, the authors proved the existence of an Environmental Kuznets Curve that indicate a decoupling between deforestation and economic conditions. Deforestation thus appears as a sign of precariousness. Finally, other studies focused on the relationships between landscape dynamics and health issues such as Malaria at the cross-border area between French Guiana and Brazil (Roux et al., 2018) or dengue in urban areas (Gregorio et al., 2017). These studies promote the elaboration of efficient transnational monitoring systems to reduce health vulnerability (Gurgel et al. 2017, Roux et al., 2016, Van Gastel et al. 2018, Peiter et al., 2018).

2 List of publications in peer review international journals

Arvor D., Daher F., Briand D., Dufour S., Rollet A.-J., Simões M., Ferraz R.P.D. 2018. Monitoring thirty years of small water reservoirs proliferation in the southern Brazilian Amazon with Landsat time series. ISPRS Journal of Photogrammetry and Remote Sensing.

Arvor D., Funatsu, B., Michot V., Dubreuil. V. 2017. Monitoring Rainfall Patterns in the Southern Amazon with PERSIANN-CDR Data: Long-Term Characteristics and Trends. Remote Sensing, 9, 889.

Arvor D., Tritsch I., Barcellos C., Jégou N., Dubreuil V. 2017. Land use sustainability on the South-Eastern Amazon agricultural frontier : Recent progress and the challenges ahead. Applied Geography. 80, 86-97.

Arvor D., Daugeard M., Tritsch I., de Mello-Théry N.A., Théry H., Dubreuil V. 2016. Combining socioeconomic development with environmental governance in the Brazilian

Amazon : the Mato Grosso agricultural frontier at a tipping point. Environment, Development and Sustainability. pp. 1-22. doi : 10.1007/s10668-016-9889-1

Bugnicourt P., Guitet S., Santos V.F., Blanc L., Sotta E.D., Barbier N., Couteron P., 2018. Using textural analysis for regional landform and landscape mapping, Eastern Guiana Shield. Geomorphology, in press, doi:10.1016/j.geomorph.2018.03.017

Cabral, A.I.R., Silva, S., Silva, P.C., Vanneschi, L. and Vasconcelos, M.J., 2018. Burned area estimations derived from Landsat ETM+ and OLI data: Comparing Genetic Programming with Maximum Likelihood and Classification and Regression Trees. ISPRS Journal of Photogrammetry and Remote Sensing, 142, 94-105.

Silva S., Vanneschi L., Cabral A.I.R., Vasconcelos M.J. 2017. A semi-supervised Genetic Programming method for dealing with noisy labels and hidden overfitting. Swarm and Evolutionary Computation, 39, 323-338.

Tritsch I., Arvor D. 2016. Transition in environmental governance in the Brazilian Amazon: emergence of a new pattern of socio-economic development and deforestation. Land Use Policy, 59, 445-455.

3 List of publications in peer review national journals

Laurent F., Arvor D., Daugeard M., Osis R., Tritsch I., Coudel E., Piketty M.-G., Piraux M., Viana C., Dubreuil V., Hasan A.F., Messner F. 2017. Le tournant environnemental en Amazonie: ampleur et limites du découplage entre production et déforestation. EchoGéo, 41.

4 List of publications in international conferences

Arvor D., Funatsu B., Michot V., Dubreuil V. 2017. Padrões de precipitação no Sul da Amazônia baseado no PERSIANN-CDR: Caracteristicas e tendências. SBSR 2017, Santos, Brazil.

Arvor D., Daher F., Corpetti T., Laslier M., Dubreuil V. 2016. Monitoring of artificial water reservoirs in the Southern Brazilian Amazon with remote sensing data. SPIE conference, Edimbourg, Ecosse.

Bailly A., Arvor D., Chapel L., Tavenard R. 2016. Classification of MODIS time series with dense Bag-Of-Temporal-Sift-Words: Application to cropland mapping in the Brazilian Amazon. IEEE Geoscience & Remote Sensing Symposium, Pékin, Chine

Dubreuil V., Fante K., Planchon O., Sant'Ana Neto J.L., 2017 : Fréquence et diversité des types de climats annuels au Brésil pour la période 1961 - 2015. Actes du XXXe Colloque de l'AIC, Sfax, Tunisie, pp.211-216

Roux E., Saldanha R., Barcellos C., Mandon T., Gomes M., Mosnier E., Guarmit B., Desconnets J.-C. 2018. Cross-border epidemiological data integration and harmonization – Application to malaria in the cross-border area between French Guiana and Brazil. In Latin America and the Caribbean Scientific Data Management Workshop (ICSU-WDS, ABC, Museum of Tomorrow), April 2018, Rio de Janeiro, Brazil

Gregorio L.S., Gurgel H., Dessay N., Sousa G.M., Roux E., Ramalho, W.M. 2017. Evaluation of the technique of population estimate people in pixel and your potentiality in the studies of

Dengue in the Federal District-Brazil. In: GEOMED 2017 | X international, interdisciplinary conference on spatial statistics, geographical epidemiology and geographical aspects of public health, 2017, Porto. Abstract book GEOMED 2017. Porto: I3S. Available in: http://www.i3s.up.pt/geomed2017/Geomed%202017_BOOK.pdf

Gurgel H., Laques A-E., Barcellos C., Handschumacher P., Dessay N., Roux E. 2017. Observation of the territory and indicators in order to support health and environment management in Brazil. In: 17th International Medical Geography Symposium, 2017, Angers - France. Abstracts IMGS 2017. Angers: University of Angers. Available in: http://www.irdes.fr/imgs2017/sessions-pre-program.pdf

5 List of book chapters

Van Gastel B., Peiter P.C., Morel V., Roux E., Franco V. Da Cruz, Mendes A.M., Eugenio N.C., Gomes M.S.M. 2018. Accès aux soins, prévention des maladies vectorielles et coopération transfrontalière en santé : une analyse qualitative à la frontière franco-brésilienne. In Frontière, territoire de santé et réseaux de soins, Artois Presses Université, accepted

Peiter P., Van Gastel B., Roux E., da Cruz Franco V., Suarez-Mutis M. 2018. Villes frontalières entre le Brésil et la Guyane Française: un contexte de vulnérabilité sanitaire (bilingue français /espagnol). In Ville habiter habitat, accepted

6 List of other publications

Barbier N., Couteron P. (2015). FOTO Fourier Based Textural Ordination (Version v1.2). Compiled Matlab scripts for applying textural feature extraction methods. [Software]. Zenodo. http://doi.org/10.5281/zenodo.1216005

Bugnicourt, P., Guitet S., Santos F. V., Blanc L., Sotta D. E., Barbier N., Couteron P.. (2018). Regional landform and landscape digital maps for the Eastern Guiana Shield (Version March 21, 2018) [Data set]. Zenodo. http://doi.org/10.5281/zenodo.1226381

Roux E., Van Gastel B., Peiter P., Da Cruz Franco V., Morel V., Eugenio N. Mendes Anapaula (2016). Vulnérabilité, accès aux soins et à la prévention des maladies vectorielles et coopération transfrontaliers - Cas de la zone transfrontaliers Guyane - Brésil. Séminaire de restitution de l'OHM Oyapock, décembre 2016