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CO₂ Capture Capacity Measurement Using Multitemporal Analysis and Biophysical Variables in a Tropical Humid Forest in the Colombian Andes

[Sustainability \(Switzerland\)](#) • Article • [Open Access](#) • 2024 • DOI: 10.3390/su16114809

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Abstract

This study analyzed the CO₂ capture potential for the Parque Natural Regional Serranía de las Quinchas buffer area in Colombia. For this purpose, multitemporal analysis for land covering for the years 1989, 2000, 2006, 2011, 2017 and 2021 was performed using the normalized difference vegetation index (NDVI) for each cover and land cover (LC) methodology. In the same way, aboveground biomass (AGB) was measured for representative parcels by measuring tree diameters and heights and applying adequate allometric models; carbon content in soils was measured too. The results showed that carbon content in soils is higher than that in aboveground biomass. Average values for the tree parcels were above 2 times the value recorded for average tropical humid forests, and one of them had a value 7 times this value. A very interesting potential for existing forest recovery was found for this area. Strategies for this include the development of sustainable practices, land use management, biodiversity preservation and the participation and leading of the local communities. © 2024 by the authors.

Author keywords

aboveground biomass; carbon stock; Colombia; geographic information systems; land cover; remote sensing data; spatiotemporal analysis; vegetation indices

Indexed keywords

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Andes; Colombia

GEOBASE Subject Index

aboveground biomass; biodiversity; carbon sequestration; land cover; land use; NDVI; satellite data; spatiotemporal analysis; tropical forest

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CO₂ Capture Capacity Measurement and Biophysical Validation in a Forest in the Colombian Andes

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Abstract

This study analyzed the CO₂ capture potential for the forest in Colombia. For this purpose, multitemporal analysis from 2010 and 2021 was performed using the normalized difference vegetation index (NDVI) methodology. In the same way, aboveground biomass was measured by measuring tree diameters and heights and applying allometric equations. The results showed that carbon content values for the tree parcels were above 2 times the value that they had a value 7 times this value. A very interesting finding is that the strategies for this include the development of sustainable forest management, preservation and the participation and leading of the

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Water science library: Nature-based solution to the hydrosocial cycle, La Honda neighborhood, Medellín-Colombia

[Cienciateca del agua: solución basada en la naturaleza del ciclo hidrosocial, barrio La Honda, Medellín-Colombia]

[Revista 180](#) • [Article](#) • [Open Access](#) • 2024 • DOI: 10.32995/rev180.Num-54.(2024).art-1265

[Marín, Luisa María Restrepo](#)^a ; [Plata, Eneyda Caridad Abreu](#)^b ; [Serra, David Jonathan](#)^b ; [Lopera, Adolfo Emilio Arboleda](#)^a ; [Castro, Diego Alejandro Camargo](#)^c

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Abstract

The hydrosocial cycle refers to the historical, geographical and anthropological link that populations have developed with water processes in the territory stated by Colombia Anfibia (2015) (Jaramillo Villa et al., 2016). In this context, we found a gap in the lack of studies focused on the analysis of anthropic adaptation processes to the watersheds of the city of Medellín, specifically in the La Honda ravine, located in the homonymous neighborhood of commune 3 Manrique (Medellín). The present work, in harmony with the Medellín Climate Action Plan, aims to investigate the hydrosocial cycle of the neighborhood and the La Honda ravine, through a research synergy between the Universidad Santo Tomás (branches of Medellín and Bucaramanga), the Institute of Human Rights, Reconciliation and Peace (USTAMED) and the local community. During the investigation, the participatory methodology Transformative Actions La Honda has been implemented, structured in three main moments, called: Building ties, Co-creation and Creation workshop, which has allowed to establish ties between civil society and the academic community on fundamental topics such as: Sustainable environmental development, Human rights,

construction of public policy and peace scenarios. Having as main conclusions some architectural design premises as "Solutions based on nature", jointly developed by the population of the neighborhood, students and research teachers, with the purpose of reaching in the future a work built linking public-private entities. © 2024 Universidad Diego Portales. All rights reserved.

Author keywords

anthropology; Architecture; climate change; hidrosocial cycle; Medellín; social cartography

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Water science library: Nat hydrosocial cycle, La Honda Colombia

[Cienciateca del agua: solución basada en la naturaleza Medellín-Colombia]

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Effects of climate change and land use on the hydrologic regime using the Hydro-BID tool: A case study of the Andean mountain basin in Colombia

[Journal of Water and Climate Change](#) • Article • [Open Access](#) • 2024 • DOI: 10.2166/wcc.2024.197

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Abstract

Changes on the land surface generate changes in land cover, which directly affect the availability of water in watersheds. This article evaluates the case study regarding the effects on the hydrological regime of the Andean mountain basin on the Coello river basin in Colombia due to changes in land use/land cover during the 2000–2019 period by the use of the Hydro-BID tool. The physical analysis of the land surface included the processing of Landsat 7 ETM and Landsat 8 OLI satellite images for the years 2001, 2003, 2015, and 2019. Seven types of coverage were determined based on these data using the Mixed Gaussian Method. The changes between each year were evaluated, after which the land use/land cover change for the year 2050 was predicted using a Markov chain. The multi-temporal analysis showed a decrease in forested areas during the studied period, while low vegetation significantly increased within the watershed. This trend was shown to continue in the future scenario for the year 2050, with an increase in flow on the watershed of 59.6%. Additionally, the climate change scenarios were modeled

with the changes in land use. The combined effects established a progressive decrease in the modal flow. © 2024
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Author keywords

climate change; Hydro-BID; hydrologic regime; land use

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GEOBASE Subject Index

hydrological regime; land use change; Landsat; satellite imagery; scenario analysis; spatiotemporal analysis

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Effects of climate change on hydrological regime using the Hydro-BID tool in the Andean mountain basin in Colombia

Journal of Water and Climate Change • Article •

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Abstract

Changes on the land surface generate changes in land use/land cover (LULU) in watersheds. This article evaluates the case study region of the Andean mountain basin on the Coello river basin in Colombia during the period by the use of the Hydro-BID tool. The physical characteristics of the basin were determined based on these data using the Mixed-Use Classification (MUC) method. Landsat 7 ETM and Landsat 8 OLI satellite images for the period 2000-2020 were evaluated, after which the land use/land cover changes were analyzed. A multi-temporal analysis showed a decrease in forest cover and a significant increase in forest loss within the watershed. This trend is projected to continue until 2050, with an increase in flow on the watershed of 50%.

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