

## THE IMPACT OF SOIL EROSION ON REAL ESTATE

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### **ABSTRACT**

*This paper examined the impact of soil erosion on real estate. Extensive literature review was carried out to expose the impact of soil erosion on real estate. The study found that soil erosion impact negatively on real estate. The impacts include decrease in property values, destruction of properties, exposure of foundations of buildings, destruction of coastal roads, harbours and beaches. The study further revealed the loss of income of residents in communities affected by the erosion and the local and national economies. It also negatively affected the education of the residents of the local communities and pollutes water ways. The study concludes that erosion negatively impacts real estate, environment and the economy. The study recommends that proper erosion control measures should be put in place to curb this environmental menace.*

**KEYWORDS:** *Soil, Erosion, Real Estate, Environment, Property Value*

### **INTRODUCTION**

Erosion is one of the environmental problems confronting the global environment and economy. According to Zinser, Miranowski, Shortle and Monson (1985), land and water resources are affected by soil erosion in South Africa. Soil erosion is a natural process, but accelerated by human activities such as clearing of vegetation, soil tillage or overgrazing. Erosion is the degrading of the top soil. The main causes of soil erosion include wind and water actions, poor farming practices and agricultural intensification (Zinser, et al, 1985). Prolonged erosion leads to irreversible soil loss over time, reduction of the ecological balance (e.g. biomass production) and hydrological functions (e.g. filtering, infiltration and water holding ability) of soil. Several scientists agree that the cost of food production is increasing in many parts of the world due to erosion and loss of nutrients (Zinser, et al, 1985). Real estate near oceans and rivers are impacted by shoreline erosion. The property boundary adjacent to the water is negatively influenced by forces of nature all year round ([www.ncrec.gov/Brochures/Coastal.pdf](http://www.ncrec.gov/Brochures/Coastal.pdf)). Erosion can decrease crop yields and profitability. When soil is carried into surface and groundwater, the eroded sediments and sediment-bound nutrients and chemicals can affect water quality (<https://www2.gov.bc.ca/.../soil-nutrients/management/erosion-control>). It is against this background that this review was undertaken to examine the impact of erosion on real estate.

### **LITERATURE REVIEW**

Beracha, and Skiba (nd) investigated the extent to which coastal land erosion is capitalized into waterfront residential properties value in a location of regular land erosion occurrence and properly documented. The study found that the rate of land erosion negatively affects coastal residential property values. Agyarko, Adu, Gyasi, Kumi, and Mensah (2012.) conducted a study from August to November, 2010 on soil erosion of thirty houses each, in four communities in Ghana. A

tape and string were used to measure the slope and depth of foundation exposure of the houses. Questionnaire and interview were also utilised to solicit data from owners of houses. Their study found that the foundations of all the houses in the four communities were exposed while majority of the houses (57%93%) had severely exposed foundations up to 51-100 cm. The extent of building foundation exposed by soil erosion and age of building and the slope of the land were positively correlated. Soil erosion is controlled by blocking water ways with materials such as, sand heaps, stones and sacks filled with soil by most respondents. In one of the communities, 10 % of the respondents planted grasses around their houses to control soil erosion. The study recommended that residents of communities should be educated to plant grasses around their houses to beautify the surroundings and to control soil erosion.

Leartherman (2018) examined the impact of coastal erosion on the National Flood Insurance Program (NFIP), the economic viability and the integrity of the environment of coastal communities in the United States. The research found that homes along the U.S. Atlantic and Gulf coasts are vulnerable to erosion risk similar to that of coastal flooding. However, the NFIP currently does not map erosion hazard prone areas and was unable to inform homeowners of the risk to their property. Hence, insurance rates do not reflect the magnitude of the erosion risk.

According to Roberts Jr (2005) in 1995, a devastating mudslide of 600,000 tons of mud and silt buried nine homes in La Conchita, a coastal community in western Ventura County, California and they were able to recover from it after a few years. Short (2008) stated that for the 50% of the Australian coast, the shoreline is building seaward and in some places eroding landward. In most locations, this is a natural process with usually no impact on human settlement.

Bottom of Form Zhang, Douglas and Leatherman (2004) stated that one of the effects of global warming is rise in sea level across the globe. The resulting flooding from rising seas will seriously impact low-lying areas inhabited by least 100 million persons within one meter of mean sea level and are at high risk in the coming decades. Sea level rise threatens the some Island states and deltaic coasts. The most heavily developed and economically valuable real estate will be threatened by increased sandy beach erosion. Fixed structures close to the beach will be destroyed as a result of the direct impact of the beach loss unless protective measures are taken. Their study found that there is a highly multiplicative association between long-term sandy beach erosion and sea level rise. The study revealed that there is reasonable quantitative agreement with observations of 19th and 20th century sea levels and coastal erosion. This result shows that the severe coastal erosion occurrence in the 20th century will increase in the 21st century due increased global warming.

Bressan (nd) stated that erosion caused by rain; flowing water and the sea affect the coastal areas. According to Bressan (nd) a sea level rise projection of 2.5 to 3 feet in the next 100 years is a threat to low-lying coasts with flood, accelerated coastal erosion and causing a retreat of the shoreline, threatening buildings and infrastructure built along shores or cliffs. According to Bressan (nd), a research revealed that erosion rates along the famous white chalk cliffs of Dover worsen.

Foteinis and Synolak is (2014) studied shoreline retreat in Greece, at Lasithi Prefecture, Crete. To assess the current situation, the authors surveyed 200 km of coastline. The study identified Twenty-five locations as vulnerable or actively eroding. Their study analysed historic aerial photos from the 1960s, newer satellite imagery, and field survey measurements. The study showed that, in the last 50 years, shoreline retreat in this region is up to 0.5 m / year and has amplified during the last two decades. The main causes are unplanned urbanization, sand mining directly from the beaches and riverbeds, poor design of coastal structures and coastal roads, contraction of harbours, jetties

and extensive and unplanned armoring of the coastline to control erosion. The study revealed that the majority (70 %) of Greek sandy beaches are eroding with rates ranging from 0.1 to 0.5 per year. Fifteen of the 25 communities studied were deemed as non-resilient in the sense that their economies could not withstand the loss of their beaches. The authors recommended that integrated coastal zone management and public education are important to save what is left of Lasithi's beaches.

Zinser, Miranowski, Shortle and Monson (1985) found that rising relative energy prices reduce soil erosion, complement soil loss restriction policies and have an impact on subsidies for soil erosion abatement. They suggested that to develop public programs to control soil erosion, should not ignore other economic trends which may affect soil erosion.

Roux and Smith (2014) investigated the nature and distribution of soil erosion in South Africa, using satellite imagery and the resulting map showed that all provinces were affected by gully erosion. The study revealed that Northern Cape and Eastern Cape were most severely affected 160, 885 hectare (ha) and 151, 759 ha respectively. The others affected include KwaZulu-Natal with 87,522 ha, the Free State with 64, 674 ha, Limpopo with 58,669 ha, Western Cape with 25,403 ha, Mpumalanga with 17,420 ha, North West Province with 10,782 ha and Gauteng with 110 ha.

O'Connell (nd) examined the impacts of shoreline armoring and management along the shores of Massachusetts and Kauai, Hawaii. According to O'Connell (nd), shoreline armoring has both beneficial and adverse effects. The beneficial effects include maintaining valuable waterfront real estate, reduction of direct exposure to damaging coastal storm waves and flooding of properties and protecting the sales value of individual properties along the water front. The financial benefits of maintaining the value of waterfront construction due to armoring is only for the waterfront dwellings or dwellings within very close proximity to the shore. Property values inland lowers with the on-going effects of shoreline armoring, and even waterfront property values decline as more and more waterfront property owners rely on shoreline stabilization/armoring. The adverse impacts include reduction in the beneficial functions and sometimes total loss of valuable coastal resources, such as beaches, dunes, and intertidal areas. This results in the loss or alteration of associated marine habitat and restriction or total loss of Lateral beach access. The loss of sandy beaches, have great importance in states such as Hawaii which provide majority of jobs and income for the residents and the state's economy. Beach tourism is by far the largest tourism industry in the U.S. (Houston, 1996 cited in O'Connell (nd)).

Nikolaos, Dimitra and Agapi (2011) reviewed literature on the relationship between real estate market and environment risk in Europe and America. According to the authors, it is widely agreed in the globe that not only economic and productive factors affect the real estate market, but also by several qualitative attributes of the natural and built environment. The study found that air quality of 1 % can increase land values up to 10% and the increase can be up to 28.7% and 41.5 % dependent on the economic level of residents. The study further revealed that properties in close proximity to highways have 810 % reduction in value than those in a quiet area; real estate's close or next to railways is 6.7 % decrease in market value and an increase in the noise of 1 decibel (db) decreases the value up to 0.3 % of suburban properties close to airports. The study further revealed that fire occurrence, flood and electromagnetic field, that is, the presence of high voltage towers decrease property values by 15 %, 412 % and 10 % respectively.

Majority of oceanfront real estate is situated in barrier islands in North Carolina and is at risk of shoreline erosion. These real estates are threatened by storms and beach erosion and negatively impact its value. (<https://www.hobbsrealty.com/sites/default/files/>)

According to the Ministry of Agriculture, British Columbia (2015) soil erosion is a problem in the Peace River Region of British Columbia and that crop residue management can be used by producers to control erosion of fields. Bare and smoothly cultivated fields can be heavily eroded during rapid snowmelt and high summer rainstorms. Fields with rough clods and stubble surfaces are erosion resistant particularly fields with standing stubble. At the beginning of winter, the stubble should be anchored to the soil for optimum resistance to wind and water erosion. Flat stubble protects against the impacts of raindrop, protects little for snowmelt runoff or wind erosion. In order to protect the soil effectively against erosion, the surface should be covered with 30 % to 50 % of anchored residues and uncultivated field or fallowed field with 8090 % residue. (Ministry of Agriculture, British Columbia, 2015)

Ghosh and Sahu (2019) conducted a study on the impact of river bank erosion on the education of erosion victims as a result of population displacement in 19 areas along Ganga-Bhagirathi River banks, Jangipur sub-division, Murshidabad district, West Bengal. The Methods of data analyses were Pearson's correlation and multiple linear regression analyses using SPSS software. Their study found that population displacement and child labour were correlated positively and significantly ( $r = 0.51$ ), low average year of schooling in almost all the selected study units, and the multiple linear regression analysis result revealed an adverse impact on the education of the residents along the river banks due to the erosion.

## **METHODS**

The study carried out an extensively literature review of the impacts of erosion on real estate. The study encompasses all forms of erosion and real estate such as residential, commercial, industrial, agricultural, tourism and other real estate.

## **FINDINGS OF THE STUDY**

The literature review revealed that erosion impacts real estate and the economy, negatively. A major impact is the decrease in property values. It also exposes the foundations of buildings and a major threat to valuable real estate. Erosion is also a major cause of the loss of beaches, jobs and income particularly in the tourism sector. The study also revealed that erosion causes loss of top soil, soil nutrients, agricultural products and result in low yield of agricultural products. The erosion also destroys buildings, harbours, roads and other real estates. Erosion causes displacement of residents and subsequently impact on the education of the children of the displaced families. Erosion also leads to the non-resilience of the economies of impacted areas. The effects of soil erosion include the loss of fertile land, increased pollution, sedimentation of streams and rivers, clogging of waterways, death and reduction of fishes and other species. The review also revealed that erosion can be controlled by shoreline armouring, soil residue management, planting of grasses and ornamental plants.

## **CONCLUSIONS**

The paper examined the impact of erosion on real estate. The study reviewed literature by several authors and found that erosion negatively impacts real estate and the economy. The negative impact includes reduction of property values, exposure of foundation of buildings, destruction of buildings, coastal roads, harbours, jetties and beaches. The erosion also negatively affects residents' income, education and loss of jobs. Erosion also negatively impacted on local and national economies, depending predominantly on beach tourism. The study also found that erosion impact agricultural land and products, negatively. The study concludes that erosion is a negative externality to the environment and economy. In order to curb this externality, proper erosion control policies and mechanisms should be adopted.

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