

Dynamics of Land Use and Land Cover Change in Salt Lake City, Kolkata, West Bengal

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Abstract

Land use land cover change is an important parameter to determine urban expansion. Urban Sprawl outside large cities expand the city itself and brings the demand for extending infrastructure and offerings in the direction of adjoining municipal and panchayat areas. It additionally influences the housing condition of pre-urban areas such as nearby land market. Property prices shoot high as the real property market prices increase and the affordability of the humans in urban fringes starts to get challenged. The present study discusses the urban expansion in the Salt Lake City of Kolkata and explains the factors and dynamics of urban expansion in the city.

Introduction

Massive urbanization during the past 20 years has resulted in a large discount in green cowl required for the ideal equilibrium of countless parameters in an urban Metropolitan vicinity among these parameters land use or land cover and land floor temperature are the most important the thought of land floor temperature has been widely used by many researchers across the world for quite a number research on radiation budget and local weather trade (Griend and Owe, 1993). The motivation for the development of salt lake town comes from the events characterizing existence in Kolkata known via its social political and cultural activities amongst many issues the town was once faced with poverty and overcrowding. West Bengal authorities realized that serious steps have to be taken to get to the bottom of the situation one of the Actions of the government was the introduction of so-referred to as “NEDECO” plan for the reclamation of effective areas of the salted Lake found by the potential of the smooth for metropolis planning the conceptualization covers the suggest dreams a pastime forming graph bases the vicinity three elements were chosen urban personality new versus Old Town inhabitants Newtown increase smartphone voice cutting-edge land-use parting of the municipal place the awareness of the Salt Lake master plan as a phase of the municipal neighborhood is proven with the aid of an overview of carried out infrastructure covering rose water furnish see which location level stormwater drainage secure waste management and due to this fact thru the different municipal services such as administrative infrastructure fitness infrastructure beneficent waterbodies social-cultural infrastructure. More than 200 occurrences of land subsidence have been documented in the route

of the world for the dimension of the preceding few years (Austin et.al, 2010) land subsidence associated with groundwater degree decline has been identified as workable trouble in a variety of parts of the world decline of water desk or use metric surface effects in vertical comparison of the subsidence substances (Bover, 1977) alongside with vertical assessment herbal evaluation may also take location due to initiation or acceleration of the lateral flow of groundwater this movement is generally small but may additionally turn out to be very extensive the place floor materials are thick and or compressible and the groundwater level declines considerable (Sikdar et. al, 1996)land subsidence due to the groundwater overdraft is originally irreversible in case of inelastic assessment of the covering confining clay mattress it can be stopped only by means of halting the decline of groundwater stage on the other hand rebound off the land floor is generally insignificant even if the groundwater floor level are restored to the height prior to subsidence's (BOOMER 1977.)

The international coverage literature on the urban failures regularly cites the velocity of urban increase as a cause of danger or native the place the pace of urbanization is outstripping the ability of competence of governance establishments main to unplanned settlements on her odious land. yet feeling 2012 reminds us that populace increase that and hazards do now not cease on-off themselves generate risk. geographers of threat are constructed by using the competing claims over the resources greatly convinced that structure financial relationships govern spatial development and assign rights to a number sectors a root motive method broadens our analysis beyond the seeming failure of city governance and towards an unseen grasp of how and the place energy is being exercised to whose advantage and how it leads to Urban Development where the hazard is unequally dispensed(Mustafa, 2002).Doing so additionally makes seen the connections between catastrophe threat and everyday urban inequalities (Murray, 2009; Satterthwaite, 2003).

Any disaster causes great loss to life and property and it is believed that women and children suffer the most due to any disaster (Malik and Hashmi, 2020). Root cause comparison is uncommon in disaster plans and one-of-a-kind reliable comparison of hazard which tends to be the center of attention on the publicity approximate stipulations of vulnerability impolite calls are frequently quite far-off in unique on quickly from no eligibility things are the time and place of mess-ups requiring conceptual and social-historical perception no longer besides concern gleaned from ordinary sources of bureaucratic knowledge. Root intent additionally stands up to quantification and indexing a greater and extra popular coverage tool for understanding risk. A contrast of root purpose additionally famous drivers of vulnerability that are linked to unequal distribution of assets and differential get proper of entry to energy and rights inequality are in many instances produced with the useful resource of the equal authorities firms tasked with Disaster Risk Reduction and mitigation and often whose management and constituencies may also have a great stake in maintaining the popularity quo or furthering inequalities (LEWIS AND KELMAN, 2012; WATSON 2009).

Background of the study area:

The earliest recognized reference of Biden auger in history is that on 17 June 1756, Siraj ud - Dulah the Nawab of Bengal champ at this area to chalk out the strategy for attacking the British East India employer at Fort William. This is a darkly do the notorious massacre in black hole jail

that took place on 20 June after the loss of life of Siraj ud-Dulah in 1757 in the warfare of elegant the right the title of these swampy source Lake waters remained with Mir Zafar for an his descendants who had been supposed by means of the employer and had worn in that struggle gradually the right of the lakes went to the arms of neighborhood landlords and there happened a spot in the simple way of life in the place in 1865 the British officially noted reclamation of these saltwater our bodies By connecting it with canal now in 2012 Salt Lake is a very surprisingly developed part of Kolkata an even whole waste Bengal finally on 16 can also 1955 Calculator Gazette authorities notification used to be posted which states that the governor of West Bengal has been pleased to accumulate 8760.50 acres 35.4525 kilowatt kilometer of bakeries pisciculture area underneath the aisled of land acquisition act 1884 to limit the stress on housing an infrastructure in the 1960s the news towns search Nick used to be developed Salt Lake City grasp diagram approved on 9 April 1964 Salt Lake has developed into a satellite town to the mom town Kolkata as a substitute than a self sustained neighborhood this makes every day connection with Kolkata inevitable.

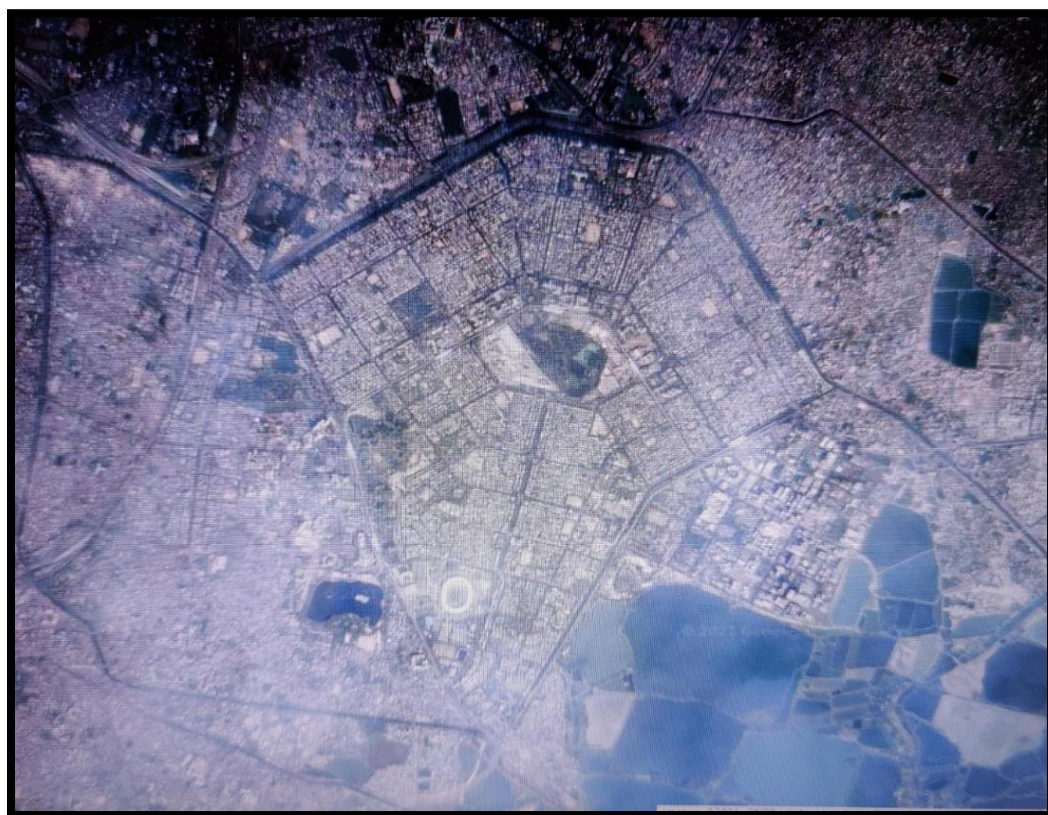


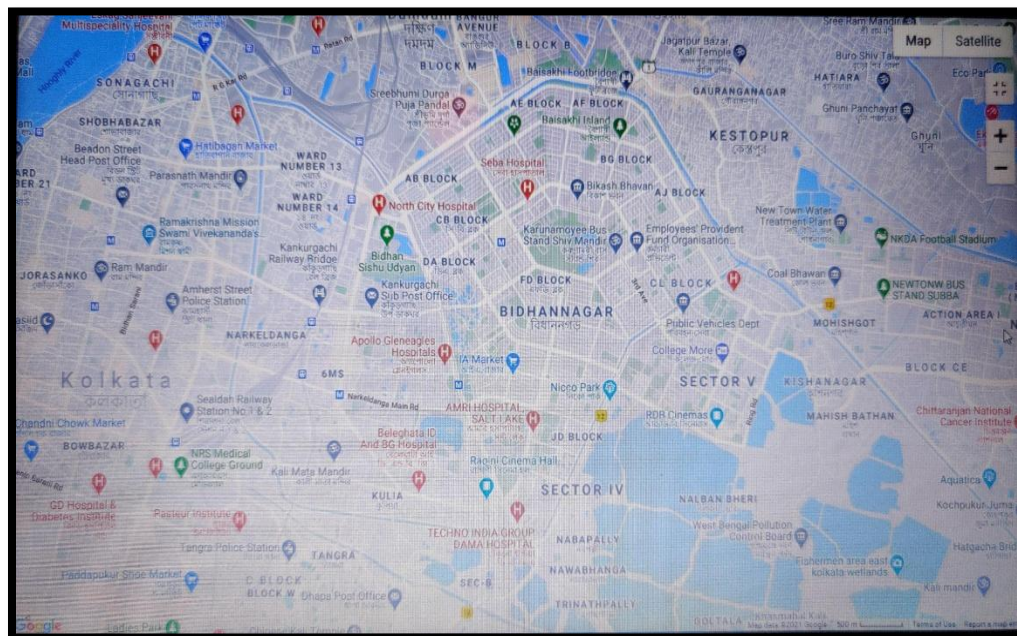
Fig.1: Map of Salt Lake City , Kolkata

Source: Google Earth engine

Study area:

The study area (Figure 1) lies between $22^{\circ} 36'' 11' N$ $22^{\circ} 33'' 29'$ latitudes and between $88^{\circ} 23'' 43'$ seconds East and $88^{\circ} 26'' 34'$ East longitudes anchoring about the region of 13158467

rectangular meters and cover is placed on a common altitude of 11 meters from suggesting sea stage. A nearly on plane land they are by is bounded with the aid of dumdum in North, Old Kolkatta make investments as properly as a new city in the eastern boundary of Salt Lake City.



: Salt Lake City

Source: Google Earth engine, map of salt lake city, Kolkata

The town is located 7.5 kilometers away from the core vicinity of Kolkata town in the eastern facet. The intention of this development used to be to set up a Township shortly gives roughly shaped as a Polygon in the total region of little more than 13158467.2 meters squared and divided into five well-organized sectors. The area similarly subdivided in blocks being a sketch Township. Salt Lake City has been divided into 25 wards and 94 blocks primarily consisting for large apartment complexes.

The land surface of Salt Lake City, Calcutta, is normally situated on aircraft land that is known as Indo-Gangetic. The local weather of the place is humid and tropical. It is characterized by using a hot and dry summer season from March to May, a monsoon or wet season from June to September, and slightly cool first-rate winter from October to February.

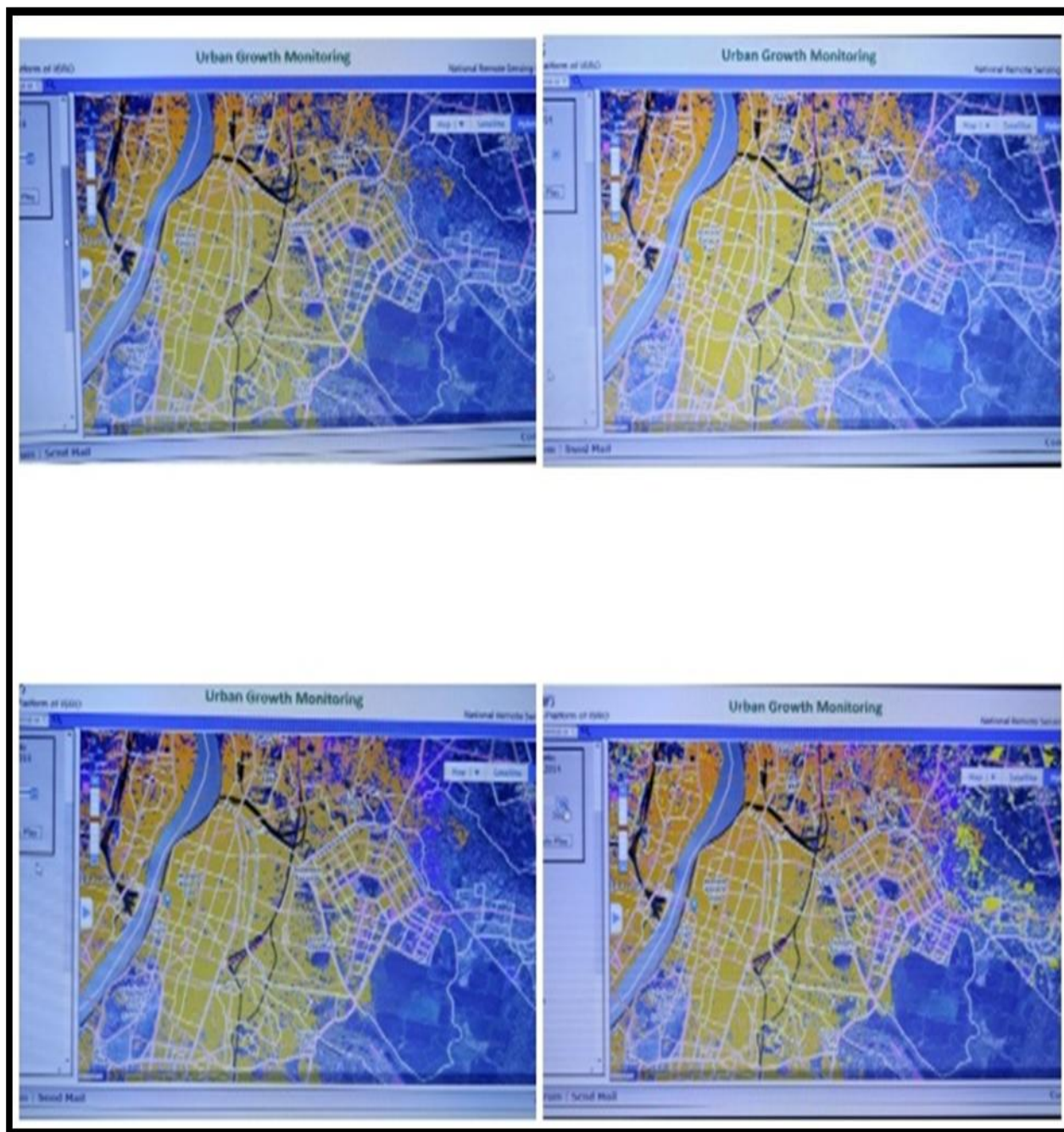
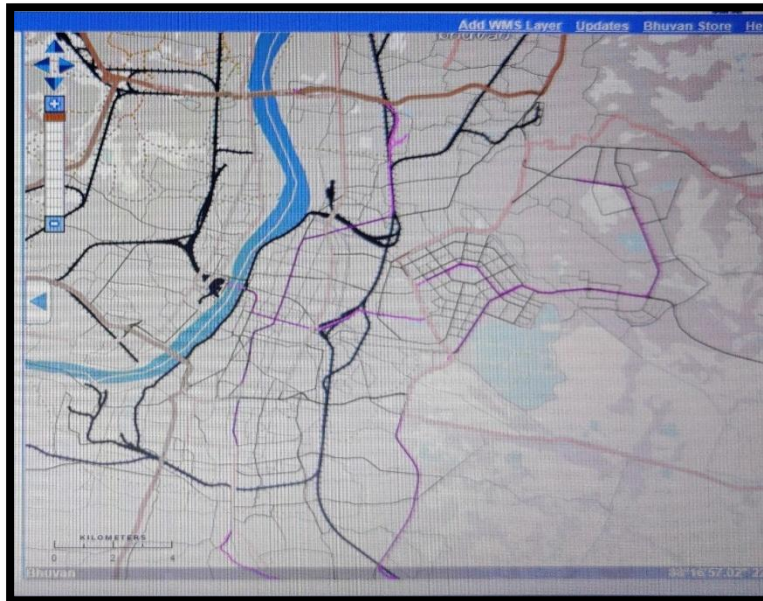


Fig. 3: Urban sprawl changes of salt Lake city Kolkata and urban growth in the city centre region Kolkata.

Source: Bhuvanportal

Town structure and shape:

Fig. 4: Shape of urban sprawl



Source: Google Earth engine. Map: Salt Lake City, Kolkata

Balancing games for coherent and compact structure with general for the open space characteristic an attempt to impervious range of residential areas as humiliation of this idea it lead to the thinking of centralized town core around this linear shape code the residential gadgets of greater density are grouped which together with the central functions make vertical accent of the city behind this interior belt the units which existing the horizontal stamp to the town are lined up the compactness of the town tissue is accomplished thru the big scope of residential areas lined up in a continuity distribute town core at one aspect and through most density with the residential zones and concentration of open area at the different aspect no populated metropolis of Kolkata restrained between the Hooghly River and salt lakes found the solution for its expansion by filling marches and brackish lakes the consciousness of these hundred years old thought was once entrusted to “Ivanmilutinovic” in Corporation with “ make investments import”, Belgrade the scheme encompass recombination of 3.75 square miles of flooded land for the town expansion the above work commenced in 1961 and was executed in 1967 about a year ahead of schedule. Reclamation was carried out with material dredged from the shoals of the Hooghly river. The material was once needed on the barges and transported to the uploading dragger the mixture of the sun and water was uploaded from the bridges and hydraulically transported to the aspect by the potential of 26” pipeline the whole pipeline diverse from 2.5 to 5 miles. Down structure without the code with Ed ministration social and emblems industry scientific academic and fitness points the large town park includes of forty-nine residential gadgets some of which are outlined within one block whilst in Adult cases two or three even four blocks make one residential unit which is a result of character dimension of some blocks and the distance from the Town Center likewise the number of inhabitants differ between minimal of

3000 after the maximum of 12,000 which is also in line with the percentage of school youngsters in this city which equals to 20%.

As the key characteristic of the learns about is constructed up vicinity growth of Salt Lake City of Kolkata which has been efficaciously recognized inside four dimensions and characterized with a spatial symptoms city boom prices compactness these measures have been explored thru urban areas that have important influences in the structure of city increase of Salt Lake City the constructed-up areas are organized in a graph urban shape with urban road network as flow work of city landscape the street networks are any other predominant elements that explain the dispersion of urban growth.

A city at risk

By almost any measure Kolkata is one of the world's most environmentally at-risk cities. Cities in the Kolkata Metropolitan vicinity which consists of the core town of Kolkata And it's shut by using the use of achievable suburbs Are oftentimes uncovered to herbal dangers alongside heavy rain and topical cyclones (WORLDBANK, 2010). Due to it's flat topography low comfort an insufficient drainage infrastructure many parts of Kolkata routinely floods at some stage in the monsoon season (WORLD BANK, 2010 A). More rare and severe floods value simply lives purpose full-size harm and affect basic services (SARKAR, 2000). In 2007 for occasion heavy rains and flooding killed at least eleven peoples disrupted Water supplies aren't precipitated a sea rage overflow that lead to outbreaks of intrigue ailment (MOJUMDAR, 2007) in 1978 the heaviest file rain in one hundred years need to catastrophic flooding and hundreds of deaths room bench 2014 over 1,00,000 households many residing in slums were displaced when Savage an effluent closing water in undated (*their houses ill in the city 1978; a hell on earth 1978*).

In 1948 Dr. Bidhan Chandra Rai turn out to be chief minister of West Bengal. He inherited a capital town in crisis the British partition of Bengal had lead to hundreds of thousands of refugees crossing the border from newly created East Pakistan many of whom took refugee in Kolkata the sudden inflow of refugees coincident with an acute housing scarcity an growing older public infrastructure producing a public fitness disaster with the River to the West an examine along the go away largely developed metropolis authentic appeared East stimulated through a visit to the Netherlands in 1949 physician Roy proposed that Kolkata must construct a new Township called Salt Lake on land recovered from the wetlands East of downtown government of West Bengal 1981 Roy think about the Township would be a Wonderland a self contained signal OSHA of multi storied housing parks market and commercial enterprise and all of the immunities essential for financial and social self sufficiency he advised no Bree pleasure the college week the younger planner employed monetary and social self sufficiency to sketch the Township that it need to house for success lower and middle classification citizens a model developed with all the amenities and facilities of a present day plant town(H CHATTOPADHYAY 1990 PAGE 11). He's vision was consistent with other plant city extension in the post independence era which aimed to achieve inclusive an integrated growth by mixing households from different social economic groups with dirty 2015.

Dos kovik set out to create a human unhealthy environment which would operate just like Garden City nittoskovik private communication March 9 2010. He was once guided with the aid of the work of modernist architects and planners probable Corbusier and Lucy Acosta his chief inspirations for Salt Lake the planned communities of Chandigarh India Brasilia Brazil Rawalpindi Pakistan he saw the Salt Lake challenge as an opportunity for Kolkata to commence a knew to abandon the ailment of the historical metropolis an embody the facilities that a planned neighborhood could provide 2D anarki he wrote in his notes.

Urban risk in Salt Lake City, Kolkata

Analysis of catastrophe hazard in solidly craving start the proximity prerequisites of eligibility are nicely protected and will the suburb surrounded through at hazard slums is no longer the product of any particular moment in the political economic system of development however there are a limp help of past an ongoing city agendas can stations on financial dependencies (ANJARIA& MACFARLANE, 2011). Examining the root of risk in Salt Lake allows us to understand the present condition of flooding their eyes or well as continues largely untimid dated (BANERJEE 2012, P. 93). Salt Lake is like not perfect along to the many large scale on globally oriented developments emerging on the fringes of the largest city but a president to them (ROY, 2010). the urban elites concurrently distancing from the quit dependency on the terrible in a social dynamic we see at work some place else on the city's periphery. In this concluding Section 1 discuss how the full trains in the political economy of improvement I have recognized as root motive of threat insert leak the commodification of hazardous land insufficient provision of inexpensive housing an immunities interdependency of specifically separated organizations an exclusive of the bad form disaster geographies in jap Kolkata an in urban India generally. After many years of a moribund economy and stagnant cruet Kolkata has start to remerge on the world economic stage. Chief minister Mamata Banerjee workplace in 2011 promising to make Kolkata like London a clean and lovely city that would stimulate personal investment and drive country economic system boom(R.BOSE,2011). Economic liberalization and new types of land hypothesis and actual estate funding have changed the open periphery from one rural areas to bur joining in clave of globalized Urban Development situated on information science and housing an immunity big name gelid in the direction of elites with global lifestyle and taste knew city and Rajar hat a excessive tech suburb underneath building just North East of Salt Lake is intended to residence over 1,000,000 people. Dozens of trends large and small are taking place along the eastern Metropolitan omit or now not S toll road that makes the increasingly urbanized border between the city and its low Ling in hinterlands. Decommodification of land by the actual property developers and requires long syndicates strolling in involved with economic organization and a supportive nation government requires that it be converted to liveable areas for city growth (BANERJEE, 2012). As the city marches East wetlands fishing forms and other features of the floodplain are being filled in paved over an otherwise consumed even in the legally designated and protected region known as the East Kolkata wetlands (BANERJEE, 2012; P. S. BOSE, 2015). political support for the transformation of the city as its edges under considerable economic benefits generated vastly outweighs warning from environmentalists about the value of such land for hazard mitigation an other critical ecosystem services(GOSH, 2005). At times on in important ways learn commodification has been challenged resisted an

undermine often by the rural poor who live and work in the place is considered as an untapped source for by economic elites (ROY, 2011 A;SHATKIN, 2011). Nevertheless the direction of open growth in Kolkata is decidedly East a trajectory of development onto his areas land initiated in large measures by the Salt Lake project.

The road is choked with traffic. The servantsquarters are now shop's which encroach on the pavement. The house becomes a block of flats. Each part has developed separately producing chaos. (TOSKOVIC, 2009,P. 19)

From the perspective of hazard exposure, salt Lake City is typical of many new towns and suburbs meant to relieve population Pressure on growing cities(KENNEDY& SOOD,2016). With the most environmentally proper land developed, cities are expanding into floodplains, unstable hillsides, and other hazardous geographies earlier viewed unsuitable. Considered in isolation, salt Lake City has uncovered a vast wide variety of humans and asset to possible losses. More broadly, deliberate trends like salt Lake establish a trajectory of boom for the larger city; the big investments in infrastructure needed to construct such settlements make similarly improvement extra viable and price effective, and past trip show's that as soon as such investments are made, it is almost not possible to trade the path of city boom (OLSHANSKY, 2009).

The modernist imaginative and prescient for city boom was most realistic on undeveloped land, tabulate resale normally determined on the periphery of present cities. For Salt Lake City, the kingdom assembled about four rectangular miles of low laying or constantly flooded land in the northern wetlands for reclamation (CHATTERJEE, 1990). It was improved the usage of hundreds of tens of millions of heaps of silt dredged from the Hooghly River, unlocking big development doable in the area and signaling an necessary shift away from the logics that had saved Kolkata's open footprint contained to higher ground close to the River reclamation began in 1962 and the first home used to be occupied inChatterjee 1990 side auto physique 1990. The population grew from 10,000 in 1981 to approximately two remaining 76,000 in 2011 through 2020 it will probably reach 5 Lac with a not a (BIDHANNAGARMUNICIPAL CORPORATION BMC 2007 KOLKATA MUNICIPAL DEVELOPMENT AUTHORITY 2005).

Rooting improvement on his thoughts land in Indian cities is happening alongside a massive shortfall in the formal production and provision of affordable housing and related immunities (SENGUPTA 2013) accounting for population growth and the period of present stocks Kolkata desires almost 70,000 knew units of housing per 12 months on year fraction of which is in reality delivered (KOLKATA MUNICIPAL DEVELOPMENT AUTHORITY 2005). with monetary liberation the kingdom city governments have scaled lower back their involvement in producing public sector low-cost housing alternatively emphasizing the involvement of the private area encouraging foreign direct investment in real property and pursuing public personal partnership for the giant scale projects (SENGUPTA 2007; SENGUPTA &TIPPLE,2007; SUD, 2014) the sizable majority of knew devices that are being constructed by means of the private sectors cater to high earnings organizations on the other hand (P. S. BOSE, 2013;SENGUPTA, 2007). Notionwide, (TIWARI ANDHINGORANI 2014) estimate that the housing shortage is in extra of 26.5 million devices almost all 26.1 million for lower earnings corporations in that context metropolis

enlargement onto his RDS land certainly requirements the formation and growth of slums as a critical source of cheap housing for the working poor.

financial liberalization an attendant real estate sectors reform has also changed the persona of city development in Indian cities as civic authorities and personal region actors try to capitalize on the building increase and appeal to non-public And international capital via promoting their cities as world an world type (BAVISKAR, 2006;SEARLE, 2014; SHATKIN & VIDYARTHI 2014). no the citywide pursuit of a world class metropolis in places like Delhi and Mumbai has flattered elite visions of open alternate proceed apace in exclusive suburbs residential enclave personal communities an hi-tech satellite cities (ROY& ONG 2011). (S. CHATTOPADHYAY,2010) argues that these bourgeois utopia's (p. 6) Are coming to define the current generation of urbanization across India and a good deal of global South see additionally (BHATTACHARYA&SANYAL,2011;WANG, KUNDU&CHEN, 2011) like contemporary kind bourgeois utopias are mostly built on a shared imaginative and prescient of what constitutes a current functional and aesthetically appealing city which gets translated into plans insurance policies and each and every practices of Urban Development (ANJARIA, 2006;BAVISKAR, 2004; GHERTNER, 2015). Scholars of the Indian city have been used a range of phrases to describe the deeply unequal pattern of urban growth emerging in the context of new liberal reforms: malevolent urbanism(MAFATLEN, 2012), bypass urbanism(BHATTACHARYA& SANYAL,2011) and enclave urbanism (SHARMA, 2010) to name a few although their context an logics very these cases point to city governance regimes that gives you the loins sheer of infrastructure services and legitimacy to the top training creating a patchwork of urban areas with unequal get right of entry to sources indispensable to mitigate catastrophe and climate alternate danger (RUMBACH, 2017)

This is no longer to say that the Indian town was ever equitable (ZÉRAH, 2008) for occasion examines the records of provider provision in Mumbai and finds longstanding distortion closer to ruling elites. In Kolkata, he notes that nation aid reform have to open economy toward technology and offerings have lead to the reconstitution of open areas to healthful the mildew of the globalized Metropolis's (CHATTERJEE 2004) the terrible without a doubt have an installed vicinity inside the metropolis as (CHAKRABORTY 2005) notes the lifts authorities have no longer haven't carried out the massive scale slum demolitions and irritations that have took regional in one of a fluctuate big cities on spatial boundaries between agencies are no longer as difficult and on a smaller scale and indoors the circumscribed areas for globalized enchantments on the one-of-a-kind hand we see the pursuit of the bourgeois city in plans and the each and each and every and every and each and every and each and each and every day practices of metropolis governance insert leak the eternal presence of horrific advocate viewed via the use of ordinary regular typical overall performance of the use of way of manageable of way of viable of slum housing Hawking and splendid encroachment onto public areas at the equal time as it's the aesthetic and barring a doubt encouraged norms the Township is charming in nearer to and is as a furnish up grant up furnish up quit give up result being expelled at least preceding I shorts and ear pics on the one-of-a-kind hand the Township relies upon on the horrible undermining effort do create spatial distance and predominant to a patchwork of formal and casual legit and illegitimate areas indoors the large city fabric we ought to take exhibit up at on to see related

patterns of spatially separated uneven then as all at once as accelerated unbiased settlements emerged on the periphery of Kolkata and one-of-a-kind Indian cities as would classification inclinations are deliberate to furnish up jointly on an creating extent of hazardous land and barring provision for vain horrible (RUMBACH,2017).

Conclusion:

The Salt Lake is instructive for planners and policymakers concerned with constructing disaster and local weather resilient cities it argues for a necessary view of disaster hazard that extends beyond the proximate drivers of vulnerability the seeming failure of planning and in the course of questions of how flip through capability of what good judgment open areas is plant of locked and govern the bargains off vulnerability we see in Salt Lake are no longer except troubles undone no in situ work to mitigate hazard in slums is quintessential to the protection and nicely being of residents it is moreover essential that we apprehend and well known larger integral relationships between elite pushed Urban Development an uneven geographies of hazard if we ever to handle their persevered manufacturing an proliferation.

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