

Architectural interventions on International Borders Evolved as consequences and alternatives of existing conditions

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Abstract

International Borders which divide geographical areas, culture and ecology lead to the creation of unique environments. These environments form the setting for different architectural spaces dependent on the border conditions. The Border itself has been an architectural entity from historic times. These spaces as such may evolve or be evolved as solutions to problems caused by the border itself, as a better alternative to the existing border condition or as political alliances for better co-operation. The line that divides can become a link that unites through architectural intervention. The present study focuses on identification of such spaces around the world, their evolution, nature and the factors that led to their creation. The study is focused on five international borders and case studies of interventions which exist or have been proposed. A detailed site analysis and the architectural analysis of the border present has been done to analyze the dependence of the factors of the context and establish the scope of intervention.

Keywords—Border; borderwall,international,boundaries,alternatives,intervention.

1. INTRODUCTION

Since prehistoric times, man has had the need to define his territory. The evolution of the Border wall and, with it the borderland, in history has been for various reasons and different meanings. Sometimes as geographical barriers like in the /Indus Valley Civilization or Greek Civilization or as Walled cities for protection such as the Great Wall of China, or to differentiate between places, people and jurisdiction as in the case of the

Map of India which has gone through a long process of evolution, before these have taken their present shapes, sizes and names. Geographic borders also define spaces of differing laws and social norms. In this way, borders create and signify varied legal obligations , social categories and behavioral expectations for different areas. (C.Diener & Hagen, 2012)

Borders can be classified based on the accessibility and material. Type of border depends on the type of diplomatic relation between countries. Geographically, international borders are expressed in varying degrees of severity: border markers, custom and immigration controls for passports and visas, fences, walls, border guards, and even national military troops. (Vogeler, 2010)

Table 1 : Classification of international borders

TYPES OF INTERNATIONAL BORDERS				
SOFT BORDERS		HARD BORDERS		
OPEN	REGULATED	FENCED	FENCED AND WALLED	WALLED
		Wired fence	Concrete walls	
		Corrugated metal	Sand berms	
		Electrified wire	Earth	
		Wooden poles	Stones	

Source: Vogeler, I. (2010). *Types of International Borders along the U.S. Mexico Border.*

Wisconsin: Department of Geography and Anthropology, University of Wisconsin-Eau Claire.

2. .NEED FOR STUDY

Borders are environments which are outside the realm of humans. The settings are various depending on endless factors. Architecture has a unique role to play in the borders by the creation of spaces as a consequence of the border conditions, voluntarily or involuntarily. Many a times these architectural interventions are solutions to the problems caused by the border itself by improving the environment, improving the quality of life of the people and fostering better relations between the countries. This study will help to determine the factors and effects of such spaces to emphasize the role of Architecture and design in the borderlands.

3. METHODOLOGY

After the preliminary study on Borders including its history, evolution and changing meaning, to the present day, the role of Architecture in the creation of borders and border spaces is assessed with supporting literature. Literature study of twenty five architectural spaces, both existing and proposed, in five International Borders of varying relations are identified. Factors dependent on the evolution of these spaces, their nature, their impact, and context were analyzed based on the nature of relationship between countries, border setting and type, socio-culture of the people, material used, Problems created by the border and their architectural typology.

Through the analysis, the most common factors and traits in the creation of the spaces and their effects were identified. These were cross checked in general with other secondary factors and thus, the dependence on the factors under question was confirmed. This led to the

understanding of the evolution of architectural spaces and formed the base for the design of architectural interventions in the borders.

4. STUDY AND ANALYSIS

4.1 Criteria for selection of case studies

4.1.1 Relationship between countries

- Friendly: India-Nepal, India-Bangladesh, US-Canada
- Hostile: India-Pakistan
- Neutral: European Union

4.1.2 Type of border

- Open: India-Nepal, European Union
- Regulated: US-Canada
- Fenced-US-Mexico, India-Pakistan, India-Bangladesh

4.1.3 Continents for a larger geographical context

- North America: US-Mexico
- Europe: Germany with other countries
- Asia: India-Nepal, India-Pakistan, India-Bangladesh

4.2 Basis for site analysis

Table 2 Parameters considered for site analysis

PHYSICAL	LOCATION
	PROXIMITY
	TOPOGRAPHY
	AREA
ENVIRONMENTAL	CLIMATE
	VEGETATION
	BIODIVERSITY
	NATURAL HAZARDS
SOCIO-CULTURAL	HISTORY
	COMMUNITY INTERACTION
	ACTIVITIES ASSOCIATED
	LANDUSE

Source:Author

4.3 Basis for border wall analysis

Table 3 Parameters considered for border wall analysis

VISUAL	SHAPE
	SCALE
	IMAGEABILITY
FUNCTIONAL	CLIMATE
	PERMEABILITY

	SECURITY
STRUCTURAL	MATERIAL
	METHOD OF CONSTRUCTION

Source:Author

4.4 Case study summary

Table 4 : Summary of the case studies

Border	Relationship	Border type	Project/Propoal/Activity	Project type	Location	Scenario	Typology
US-Mexico Border	Friendly	Hard Border - Fenced; not secured	Border Field State Park	Existing	Imperial Beach California-Tijuana	Park; tourist destination	Government Planned
	Friendly	Hard Border - Fenced; not secured	Border Gateway to Nature	Existing Solution	Imperial Beach California-Tijuana	Park built from reclaimed waste from Tijuana River	NGO Planned
	Conflict region	Hard Border - Fenced	Solar Farm as counter proposal to US Secure Fence Act 2007	Proposed Solution	Arizona-Sonora Desert	Arid desert with residential area a few miles away	Architecture firm proposed
	Friendly	Hard Border	Water treatment border wall as solution to the Pollution in the New River	Proposed Solution	New River, Calexico-Mexicali	Friendly neighborhood with commercial activities; Highly polluted River	Architecture firm proposed
	Conflict region	Hard Border-Fenced; Secured	Wall of Life safety beacons for people and Animals of both countries	Proposed Solution	Sonora Desert,Arizona-Chihuahua	Harsh Arid Desert leading to migrant deaths due to dehydration	Architecture firm proposed
	Friendly	Hard Border-Fenced	Water collection and distribution wall to prevent flooding	Proposed Solution	Nogales, Sonora-Arizona	Residential area flooding due to the border wall	Architecture firm proposed
	Neutral	Hard Border-Fenced	Wildlife Wall for animals to pass through	Proposed Solution	Sierra Madre Occidental forest,Arizona-Chihuahua	Sensitive ecological environment with endangered species	Architecture firm proposed
	Neutral	Hard Border-Fenced	Forest Wall with transplanted Sabal Palms	Proposed Solution	The Rio Grande Valley,Brownsville,Texas	Remaining stands of native Mexican sabal palms over 527 acres	Architecture firm proposed
	Friendly	Hard Border-Fenced	Very active area, People cross the border regularly into the town of Piedras Negras, Mexico, to visit families and friends	Existing	Eagle Pass, Texas-Coahuila	Border wall cuts across the soccer field	People's Intervention

	Friendly	Hard Border-Fenced	Wallyball Playground	Existing	Naco,Arizona-Sonora	Formerly united community divided by the borderwall;bord erwall being used as a playground	People's Intervention
	Friendly	Hard Border-Fenced	Soccer field	Existing	Tijuana-San Diego	Playground and community interaction space	People's Intervention
	Friendly	Hard Border - Fenced; not secured	Linear Urban Park, Bicycle/Pedestrian wall	Proposed Solution	Tijuana-San Diego	Playground and community interaction space	Architecture firm proposed
	Friendly	Hard Border-Fenced	Fandango Fronterizo-Annual Music Festival	Existing	The Friendship Park in Tijuana and Playas Lighthouse Tijuana-San Diego	venue for an annual bi-national music festival	People's Intervention
	Friendly	Hard Border - Fenced; not secured	The Burrito Wall	Proposed	Tijuana-San Diego	Public street with wall as street furniture for bi-national street food	Architecture firm proposed
	Friendly	Hard Border-Fenced	Bi-national Library	Proposed	Tijuana-San Diego	Public street	Architecture firm proposed
	Friendly	Hard Border-Fenced	Confessional wall	Existing	Friendship Park, Tijuana-San Diego	Holy communion offered across the fence	Peoples intervention, Architecture firm proposed
United States-Canada	Friendly	Open	The Haskell Free Library and Opera House	Existing	Quebec town of Stanstead and the Vermont town of Derby Line	Binational library and cultural Centre accessible by both nationals	People's Intervention
European borders	neutral	Abandoned minefields , guardtowers, bunkers	European Greenbelt Project	Existing	Barents Sea at the border between Russia, Norway and Finland, all the way to the Bosphorus at the border between Bulgaria, Greece and Turkey	Sensitive ecological environment with rich biodiversity with abandoned remains of the Iron Curtain	NGO Planned
	Neutral	Hard border-walled	The Kunstmeile	Existing	Mühlenstraße in Friedrichshain-Kreuzberg	Open air Art gallery tourist destination	Government Planned
	Neutral	Hard border-walled	Babeliotheque	Proposed	Mühlenstraße in Friedrichshain-Kreuzberg	Open air Art gallery tourist destination	Architecture firm proposed
India-Pakistan	Hostile	Hard Border-Fenced Highly secured	Hudiarra Drain	Existing	From Batala,Punjab India ,passes across Lahore	Highly polluted storm water drain that flows from Indian to Pakistan; water used for cultivation	Government Planned
	Hostile	Hard Border with gates and no man's land	Wagah Border Ceremony	Existing	On the international highway Grand Trunk Road between	:Major tourist destination; highly secure border crossing	Government Planned

					Lahore, Pakistan and Amritsar, Punjab		
	Hostile	Hard Border-Fenced Highly secured	Daily Beating retreat ceremony	Existing	Hussainwala village, Punjab-Ganda Singh Wala village, Kasur	Closed border crossing; major tourist destination	Government Planned
India-Nepal	Friendly	Open Border	Biratnagar-Jogbani Market	Existing	Biratnagar-Jogbani	Active market place famous for cheap foreign goods	Government Planned
	Friendly	Open Border	Kakarbhitta Market	Existing	Kakabhitta, India n side	Active market place	Government Planned
	Friendly	Open Border	Mirik	Existing	Pashupati Market	Active market place	Government Planned
India-Bangladesh	Friendly	Controlled Border crossing	Dolora-Balat Border Haat	Existing	Sunamganj-Meghalaya	Active market place	Government Planned
	Friendly	Controlled Border crossing	Baliamari-Kalaichar Border Haat	Existing	Kurigram-Meghalaya	Active market place	Government Planned

Source : Author

4.5 SUMMARY OF SITE ANALYSIS

Table 5 : Summary of Site analysis of case studies

		Border Field State Park	Border Gateway to Nature Project	Solar Security	Water security	Border as beacon of life
Physical	Location	Residential beach city, Tourist Destination	Tourist destination	Arid region with residential area	New River	Hot Arid desert with no habitation
	Proximity	San Diego downtown and Tijuana downtown	Imperial beach	Sonoran desert	Agricultural lands, residences and commercial areas	vast stretch of harsh desert
	Topography	Sand dunes & salt marshes	Sand dunes & salt marshes	Sand dunes	Generally flat with the river flowing north west	Sand dunes and rocky terrain
	Area	1316 acres	1316 acres	2000 acres	515 km	100,000 square miles
Environmental	Climate	Mediterranean climate with lower temperatures than the surrounding metropolis	Mediterranean climate with lower temperatures than the surrounding metropolis	Dry arid desert climate	dry and mild summers, cool and rainy winters	Harsh hot and dry climate
	Vegetation	Tijuana River National Estuarine Research Reserve	Tijuana River National Estuarine Research Reserve	Thorny bushes, grasslands	bushes and shrubs, agricultural land	palm, cactus, legumes

	Biodiversity	Endangered birds and wildlife	Endangered birds and wildlife	Desert life	aquatic life	Desert life
	Hazards	Flooding, environmental impact	Flooding, environmental impact	High temperatures , heat waves	Highly polluted river from toxic waste of industries	Heat waves,dehydration,sand storms
Socio-cultural	History	In 1850, delegations from both countries began surveying the boundary at this location	Frequent flooding, influx of sediments & trash gave it the name "the ugliest state park"	Established as a result of the Gadsden Purchase of 1853.	autumn of 1904 heavy rainfall and snow-melt caused the Colorado River to swell, overrunning a set of head gates	More than 2000 migrants perished due to dehydration
	Community interaction	interaction between Mexico and US beach goers	Accessible to both US & Mexico nationals	border community, attracting business from the other side of the line. Folks cross the border each day to shop, work, and socialize.	no interaction between the nationals of two countries	No human habitation
	Activities associated	camping,bicycling,surfing,farmer's market	Recreational activities	An international volleyball game,commercial	agriculture	Natural history museum, research institutes and national park
	Land use	Recreational, Commercial	Recreation	Residential, commercial	Residential, Commercial, agriculture	institutional and recreational parks in between

		Haskell Free library and Opera house	Wildlife wall	European Greenbelt Project	Forest wall	Eagle Pass
Physical	Location	Border town extending to both countries	Rio Grande Valley, area of sensitive ecology	An extraordinary ecological network and living memorial	Rio Grande Valley, area of sensitive ecology	Del Rio sector

				landscape		
	Proximity	CANAMEX Highway, connecting Canada, the United States, and Mexico. Nogales also is the beginning of the Sun Corridor, an economically important trade region	Rio Grande River	European Union	Rio Grande River	Coahuila and San Atoniareidential areas
	Topography	Flat	Floodplains with oxbow lakes	varies and comprises of all kinds of landscapes	Floodplains with oxbow lakes	Flat
	Area	54 square km	57,000 acres	6400 km	57,000 acres	19 square km
Environmental	Climate	semi-arid steppe climate	Hot weather, warm and comfortable winters, very hot summers	Temperate climate	Hot weather, warm and comfortable winters, very hot summers	hot semi-arid climate
	Vegetation	vineyards	Riparian woodlands, Sabal Palms and many others	sensitive landscapes, and is home to the natural flora and fauna typical to the regions	Riparian woodlands, Sabal Palms and many others	Predominantly a residential area, plant life lacking
	Biodiversity	Patagonia State Park, Pena Blanca Lake, Parker Canyon Lake, and Coronado National Forest.	Home to 1,200 plants, 300 butterflies, and approximately 700 vertebrates. Many endangered species	connects National Parks, Nature Parks, Biosphere Reserves and trans boundary protected areas	Home to 1,200 plants, 300 butterflies, and approximately 700 vertebrates. Many endangered species	Densely populated hence little or no studies on ecology done
	Hazards	smuggling	Damage to the desert's plant and animal communities, and prevent the free movement of wildlife between the United States and Mexico	main threats are an intensified, industrial agriculture and forestry in the Green Belt, large infrastructure projects and unsustainable tourism.	Damage to the desert's plant and animal communities, and prevent the free movement of wildlife between the United States and Mexico	Tornado in 2007

Socio-Cultural	History	historic monuments, heritage buildings, underground tunnels for smuggling	Wildlife habitat conservation efforts began 40 years ago in one of North America's most important ecological regions, where nature tourism produces a substantial economic impact.	For almost 40 years the so-called "Iron Curtain" had divided Europe. Metal fences, walls, barbed wire, guard towers, spring guns, land mines and watchdogs created a death zone through Germany and separated one country in East and West, divided families and friends for decades.	Wildlife habitat conservation efforts began 40 years ago in one of North America's most important ecological regions, where nature tourism produces a substantial economic impact.	First American settlement on the Rio Grande. Originally known as Camp Eagle Pass, it served as a temporary outpost for the Texas militia, which had been ordered to stop illegal trade with Mexico during the Mexican-American War
	Community interaction	Trade	Tourists from both countries	Tourists from 22 countries	Tourists from both countries	Residents here cross the border regularly into the town of Piedras Negras, Mexico, to visit families and friends
	Activities associated	ghost towns, mining camps, shopping, and night clubs	Lower Rio Grande Valley National Wildlife Refuge	Tourism, recreation, Environmental education, Local food production	Lower Rio Grande Valley National Wildlife Refuge	Children playing, community gathering
	Land use	Commercial, Recreational, Residential	Recreation, Tourism, Protected areas	Protected areas, recreation	Recreation, Tourism, Protected areas	Recreation, Residential

		Binational playground	Fandango Fronterizo	Linear bicycle/pedestrian park, Cultural centres, Confession wall, Burrito wall	Derby line -Rock Island	The Kunstmeile
Physical	Location	Border town extending to both the countries	Friendship park, Residential beach city, Tourist Destination	international metropolitan conurbation largest binational conurbation	Rock Island	Mühlenstraße in Friedrichshain -Kreuzberg
	Proximity	Turquoise valley, oldest golf course	San Diego downtown and Tijuana downtown	Rosarito, Tecate in Mexico & Greater Los Angeles, San Francisco Bay	Some residents' backyard neighbors are American, while families living	River Spree

				Area	right across the street are Canadian, the international border runs through individual homes,	
	Topography	Rocky	Sand dunes & salt marshes	Coastal landscape	Flat	Flat
	Area	8.8 square km	1316 acres	40,000 square km	22 square km	1.3 km long
Environmental	Climate	semi-arid climate	Mediterranean climate with lower temperatures than the surrounding metropolis	Mediterranean climate and Semi-arid climate	humid continental climate	Maritime temperate climate
	Vegetation	Desert plants-cactus, palm, legumes	Tijuana River National Estuarine Research Reserve	chaparral and woodlands ecoregion	Residential area	Aquatic life of the river
	Biodiversity	Desert life	Endangered birds and wildlife	Terrestrial mammals, rodents and lagomorphs, artiodactyls	Residential area hence not enough study on the biodiversity done	Aquatic life of the river
	Hazards	Smuggling	Flooding, environmental impact	Pollution, Smuggling	Security issues	Vandalism, Erosion
Socio-cultural	History	Naco, Sonora, along with Naco, Arizona, came into being in 1897 as a border crossing to connect copper mines on both sides.this archeological site in the 1950s revealed mammoth bones	In 1850, delegations from both countries began surveying the boundary at this location	In 1846 the Mexican–American War began and the United States continued to expand its borders. In 1848 the war ended with the Fall of Mexico City and boundaries were redrawn which created a border between San Diego and Tijuana.	Rock Island was incorporated as a village in 1892, and became a town in 1957.	Berlin wall separated East Germany from West Germany for 28 years from 1961 to 1989
	Community interaction	Games of soccer, volleyball across the border wall	interaction between Mexico and US beach goers	Trade, Cultural Activities	Tourists, Residents	Tourists to Germany(It is no longer a border wall)

	Activities associated	Playing, Commercial	camping, bicycling, surfing, farmers' market	Maritime, Tourism, Trade, Binational cultural activities	Learning. Cultural enrichment, industrial business	Tourism, Recreation
	Land use	Residential, Commercial	Recreational, Commercial	Commercial, Residential, recreational,	Recreation	Recreation

		Wagah Border ceremony	Hussainwala-Ganda Singh Border ceremony	Bhiratnagar-Jogbani border market	Kakarbhita market	Pashupati market
Physical	Location	Grand Trunk Road	Ferozepur, Punjab	Bhiratnagar, industrial capital of Nepal	Kakarbhita and Darjeeling	Pashupatinagar and Darjeeling
	Proximity	Wagah Railway Station	Sutlej River, National martyrs memorial	Bhiratnagar, a sub-metropolitan municipality	Residential areas and tourist spots of Darjeeling	Residential areas and tourist spots of Darjeeling
	Topography	Flat	Flat	Mountain region	Mountain region	Mountain region
	Area	3 square km	2 square km	2 square km	2 square km	3 square km
Environmental	Climate	Extreme climate with high temperatures during summer and harsh cold winters	Extreme climate with high temperatures during summer and harsh cold winters	influenced by maritime and continental factors, and has four distinct seasons.	influenced by maritime and continental factors, and has four distinct seasons.	influenced by maritime and continental factors, and has four distinct seasons.
	Vegetation	Agricultural crops	Agricultural crops	Market area lacks recorded vegetation	Market area lacks recorded vegetation	Market area lacks recorded vegetation
	Biodiversity	farm animals	farm animals	Domestic animals	Domestic animals	Domestic animals
	Hazards	Terrorism	Terrorism	Smuggling	Smuggling	Smuggling

Socio-cultural	History	At the time of independence in 1947, the migrants from the Indian parts of the subcontinent entered the present day Pakistan through this border crossing. The ceremony started 56 years ago	Bhagat Singh, Sukhdev and Rajguru were cremated here on the banks of the river 1931. he village is named after the Muslim Peer Baba Hussainiwala ji. Formerly an open border crossing.	The old name of Biratnagar was Gograha Bazaar. The region is believed to be a part of the kingdom of Virata, mentioned in the Mahabharata.	No recorded history	No recorded history
	Community interaction	Sit together for the ceremony	Tourism, Agriculture	Indian and Nepalese nationals cross without restrictions.	Indian and Nepalese nationals cross without restrictions.	Indian and Nepalese nationals cross without restrictions.
	Activities associated	Tourims, Cultural activities, Commercial	Tourims, Cultural activities, Commercial	Tourism, Commercial	Tourism, Commercial	Tourism, Commercial
	Land use	Tourism, Recreation, Commercial	Tourism, Recreation, Commercial	Commercial	Commercial, Recreation	Commercial, Recreation

		Dolora-Balat border haat	Baliamar-Kalaichar border haat
Physical	Location	Set on the zero line along the northeastern state of Meghalaya in India	The Kurigram district
	Proximity	Villages	River Jinjiram
	Topography		
	Area	70-square meters	70 square meters
Environmental	Climate	Subtropical monsoon climate	Subtropical monsoon climate
	Vegetation	Agricultural crops	Agricultural crops

	Biodiversity	Domestic animals	Domestic animals
	Hazards	unscrupulous traders	unscrupulous traders
Socio-cultural	History	defunct Mughal era border haat	defunct Mughal era border haat
	Community interaction	participation is more pronounced among Bangladeshis than it is with Indians	participation is more pronounced among Bangladeshis than it is with Indians
	Activities associated	Commerce and trade	Commerce and trade
	Land use	Commercial	Commercial

Source:Author

4.6 SUMMARY BORDERWALL ANALYSIS

Table 6 : Summary of border wall analysis

		BORDER FIELD STATE PARK	BORDER GATEWAY TO NATURE PROJECT	SOLAR SECURITY	WATER SECURITY	BORDER AS BEACON OF LIFE
Visual	Shape	Linear tubular structures	Planar with linear and helical elements	Vertically articulated with corrugations	Vertically articulated	Vertically articulated following the undulations
	Scale	Multiple scales	Uniform scale	Uniform scale	Human scale	Multiple scales
	Imageability	Blends with the beach environment	Prominent in the park due to scale and material	Brown rusty color blends with the hot arid landscape but stands as a prominent sturdy opaque structure	Out of place between a river	Blends with the desert in colour and terrain

Functional	Climate	withstands waves	Withstands floods and corrosion	Withstands heat	Hardly withstands corrosion and floods	withstands high temperatures and shifting sand dunes
	Permeability	Allows visual and Physical access	Restricts physical access, allows visual access	Completely cuts off physical and visual access	Allows the river to flow through, in other areas restricts physical and visual access	Little visual access but restricts physical access completely
	Security	Not very secure	Secure	Sturdy and secure	Not very sturdy and secure	Secure although illegal trespassing is high
Structural	Material	Iron	Iron ,steel	Iron corrugated sheets	Iron corrugated sheets	wooden poles
	Method of construction	Metal rods spaced evenly	Steel mesh with iron rods and barbed wire	Corrugated sheets with sheet caps	Free standing corrugated sheets	Poles fixed at intervals following the slope

		HYDROWALL	WILDLIFE WALL	EUROPEAN GREEN BELT PROJECT	FOREST WALL	EAGLE PASS
Visual	Shape	Articulated with lines creating patterns	Series of animated frames	One thick and sturdy wall, other a corrugated fence with vertical lines and horizontal sections	Vertically articulated with vertical lines, resembles a domestic fence	rectangular sections with metal spikes on top
	Scale	Uniform scale with openings of human scale	Multiple scales	Gigantic scale	uniform scale; scaled version of domestic wooden fence	Gigantic scale
	Imageability	Represents a façade of building with windows	dynamic frames and stationery fence, wooden textures and pattern compliments the green	One shiny steel structure portraying the strong image of the iron curtain it stood for. Other sturdy wall depicting impenetrability	Brown wooden members correspond to the vegetation	metal structure cutting across a playground represents the contrast of the division

			landscape			
Functional	Climate	Blocks drainage thereby causing flooding	Withstands high temperature	Climate was never a consideration	Addresses environmental concerns in protected areas	Climate not considered
	Permeability	Allows visual access through the wire mesh, restricts physical access and even water flow	Allows visual access and physical access at some points manually. Blocks animal migration	completely restricts visual and physical access	Allows visual access throughout the length through gaps. Restricts Physical access	Completely restricts physical and visual access
	Security	Sturdy and secure	Secure but controlled access	entirely cut off migration	Secure	Secure
Structural	Material	Reinforced concrete, wiremesh, metal rods	wire mesh, wooden fence, metal frame	bricks, concrete, steel mesh (expanded metal) with sharp edges	Wood	Steel sheets, ironbars, iron spikes
	Method of construction	Reinforced concrete frame with iron rods bracing and wire mesh	Wire mesh mounted on iron rectangular frames behind a wooden plaque fence	Freestanding steel mesh (expanded metal) with sharp edges horizontal bracings. Free standing concrete wall tapering at the top.	vertical wooden members places at uniform gape with two horizontal bracings	Steel sheets mounted on iron rods fixed on the ground, with metal spikes mounted on top

		BINATIONAL PLAYGROUND	FANDANGO FRONTERIZO	CULTURAL CENTRES	WAGAH BORDER, HUSSA INWALA GANDA SINGH, BORDER HAATS
Visual	Shape	Vertically articulated with rods creating patterns	Polygonal pattern plane with horizontal and vertical rods	Rectangular and square patterns with an inclined bar	Horizontal lines on vertical posts with criss cross patterns
	Scale	Human Scale	Uniform scale	Uniform scale	Human Scale

	Imageability	Yellow and brown colours blend with the desert environment and due to human scale forms a part of the built environment	Prominent in the park due to scale and material	Cuts across streets resembling compound walls	Crude form of a fence made for security purposes only
Functional	Climate	Withstands high temperature and sand storms	Withstands floods and corrosion	Climate not considered	Climate not considered
	Permeability	Restricts physical access ,allows partial visual access	Allows partial physical access, allows visual access throughout	Allows visual access but restricts physical access	Allows visual access byt electrocuted fence prevents people from being close to the fence
	Security	Secure	Secure		Security is the priority
Structural	Material	Corrugated iron sheet, iron T sections, wire mesh	Iron ,steel	Iron rods, Steelmesh, Reinforced concrete	Reinforced concrete, Barbed wire
	Method of construction	Corrugated sheets reinforced by iron rods places alternatively to form a pattern. Wire mesh mounted on top in a frame	Steel mesh mounted on horizontal and vertical rods	Steel mesh mounted on iron rods with an inclined rod on top	Barbed wire mounted on concrete poles. Double fence with barbed wire bundle in between the gap.

Source:Author

4.7 Typology of the intervention based on the identified setting:

Table 7 : Classification of the architectural interventions based on setting and their function

SETTING	NATURE OF ARCHITECTURAL INTERVENTION
Neighborhood and communities	Social Infrastructure
Areas of sensitive ecology and biodiversity	Environmental mitigation
Across water bodies , deserts and forests	Geographic response

Conflict areas of historical significance	Symbolism
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Source:Author

4.7.1 Social infrastructure

- Intimate/formal spaces
Daily cross border activities lead to large scale project ideas or adaptation
- Organized/Involuntary Spaces
These are directly related to people, hence mostly involuntary
Large scale projects are organized by organizations or government.
- Alternative/Adaptation
Spaces are mostly adapted to suit people's needs
Alternatives mostly design proposals by architects
- Characteristics of border that affects the intervention:
 - Socio-Cultural similarities
 - Presence or absence of a boundary
Presence leads to creative adaptation
Absence leads to conventional spaces with unique characters
 - Material & design of the wall
Visibility factor

4.7.2 Environmental Mitigation

- Alteration/Application
Border is altered to mitigate issues
Border itself as a tool for protection
- Setting of the issue
Inhabited area-alteration proposals
Remote area-Large scale applications
- Characteristics of the border that affect the intervention:
 - Diplomatic relationship
 - Material and design of the wall

4.7.3 Geographic Response

- Maintaining continuity of landscape
Sharing of resources between countries
- Solution/Alternative/Adaptation
Solutions to issues caused by the border
Alternatives to mitigate problems prevalent
- Existing/Proposed
Areas of illegal migration,
Thus, execution of projects is difficult.
As counter proposals
High potential for improvement
- Characteristics of the border that affect the intervention:

- Relationship & presence of conflict
- Presence or absence of a boundary
- Material and design of the wall

4.7.4 Symbolism

- Intimate/formal
 - Intimate-Initiated by the people
 - Formal-Planned by the government
- Adapted/Designed

5. INTERDEPENDANCY OF FACTORS ANALYSED

5.1 Country relationship and nature of Border

The diplomatic relations between two countries affects the nature of the border and thus the environment. Out of the five, United States and Mexico have the most varied spaces in different settings, both existing and proposed. This might be owed to the friendly relations between the two countries and their similarities.

European countries on the other hand, owing it its open borders and have the opportunity to execute planned projects which involves not just two countries but six countries. However, the open border between India and Nepal (Figure 1), has not led to planned projects but interventions such as the border markets have evolved involuntarily. The Indo-Nepal border possesses high potential in having planned projects.

Figure 1 : Kakarbhitta and Biratnagar market, Indo-Nepal Border



Image reference: www.bordernepal.wordpress.com

Indo-Bangladesh though a closed border has had the success of Border Haats (Figure 2) or markets planned and organized by the mutual cooperation of the Governments of the two countries. This is owing to the friendly diplomatic relations where it is clear diplomatic relations have greater dependency than the nature of the border. (Bangladesh Enterprise Institute, 2004)

Figure 2 : Dolora-Balat Border Haat at the Indo-Bangladesh Border



Image reference:Position paper on border haats by Bangladesh Enterprise Institute

Another open border,United States and Canada with friendly diplomatic relations coupled with lenient regulations has enabled individual contribution in the form of a binational library on the border.This example is instrumental in illustrating the role of Architectural design combined with the function of the place.

5.2 Material and the Type of project /Proposal /Activity

Though the material of the border walls largely depend on the diplomatic relations, the material changes as scenarios in each portion of the border varies. United States-Mexico border has

different materials of border walls in different places owing to the setting-Wooden poles, corrugated metal sheets, Barbed wire, Reinforced concrete, steel sheets and wire mesh.As such the nature of the activity existing or proposed depends on the material.Many a times,it is the material that causes the problems associated with the border.

Environmental problems like inhibiting the movement of wildlife,Social issues of divided community,need for better infrastructure are some of the problems created and be tackled by the border.Where there is visibility,interaction takes place;where there is a sturdy structure,flooding occurs;thus the proposals that have come up are linked to the material of the border.Also problems have more existing projects compared to the alternatives for betterment.

5.3 Nature of the Project/Proposal/Activity and success:initiators

Interventions as solutions to Environmental problems are mainly taken up by the Non-Governmental organizations backed by the Government. Execution become easier with organized effort and funds.

Government planned projects are mostly focused on the quality of life of the people,promotion of tourism and upkeeping the traditions of the Country.As such,the projects are large scale emphasizing on planning ,like the border markets or border parks.The life span of the projects is unpredictable.

Intervention by the people has the best response though their life span maybe cut short by security concerns and creation of social issues.These interventions are largely in the form of Cultural exchanges and interactions.Individual contributions are a minority and is dependent on the legislation between the countries.These type projects are more likely have a greater role of the Architect.

5.4 Nature of Space:Intimate/Formal

The type of spaces created is directly related to the relationship between the countries and the communities on the border.These two may not be one and the same.

Wallyball playground on the US-Mexico border,Haskell free Library and Opera house on the US-Canada border and Fandango Fronterizo(Figure 4) on the US-Mexico border are intimate

spaces which reflect the relationship of the countries with or without the presence of a hard boundary. Border markets on Indo-Nepal border are informal spaces owing to the open border and friendly relations of the people. Similarity in socio-cultural aspects contributes to these spaces and the success of such designs. (Borderwall as infrastructure, Rael San Fratello, 2009)

Figure 3 : A game of wallyball in progress across the border wall in



Arizona-Sonora border

Image reference: www.fusion.net

Figure 4 : Musicians perform at the annual Fandango Fronterizo



Image reference: <http://fandangofronterizofotos.blogspot.mx/>

Figure 5 : Haskell free library and opera house

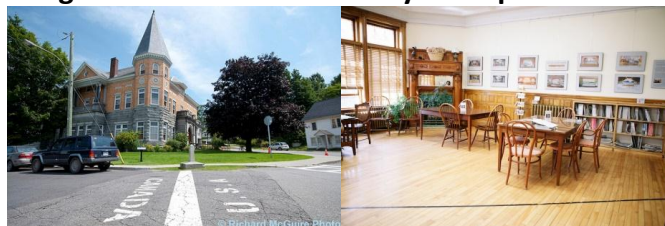


Image reference: forum.skyscraperpage.com

Wagah border ceremony and Hussainwala Border (Figure 6) ceremony spaces are organized formal gathering spaces with regulations owing to the nature of relationship. (Singh & Rangnekar, 2001)

Figure 6 : Wagah and Hussainwala border ceremony



Image reference: www.siasat.pk

Indo-Bangladesh however have border haats, which unlike the traditional markets, have been organized and regulated by the Governments as a treaty, thus it has become more of a formal gathering space for commercial exchange rather than an intimate space for interaction.

5.5 Space evolved as solution/alternative

Systematic research in the field of borders is required before proposing architectural interventions. As such access to the borders, ease of regulations and learning resources are major factors backing up proposed projects which seek alternatives to the wall.

Many of the existing spaces have been evolved as solutions to issues that maybe environmental, social or by simply neglecting the presence of the border.

As such the proposals, few in number, focus on the unaddressed issues and as counter proposals to border projects by the government.

V.CONCLUSION

The factors relating to the architectural interventions and their dependency have a complex relation. Interventions as consequences of the border will eventually lead to alternatives. Architects may use these while dealing with border projects and as such the importance of Architecture in borders created by politics is emphasized. The trend is changing and design innovations are coming into force to define these neglected spaces rather than the former barrier itself. Architecture can make the line that divides into a line that links through design interventions. Many countries have made attempts through its passionate people at encouraging architectural interventions when and where possible but a formal field study lacks in the area. With further detailed studies and documentation, these landscapes of great potential can serve to bridge the gaps.

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