



**The Urban Unit**

Urban Sector Planning & Management Services Unit (Pvt.) Ltd.




# Sahiwal


## Regional Development Plan

Environment & Social Safeguard Division

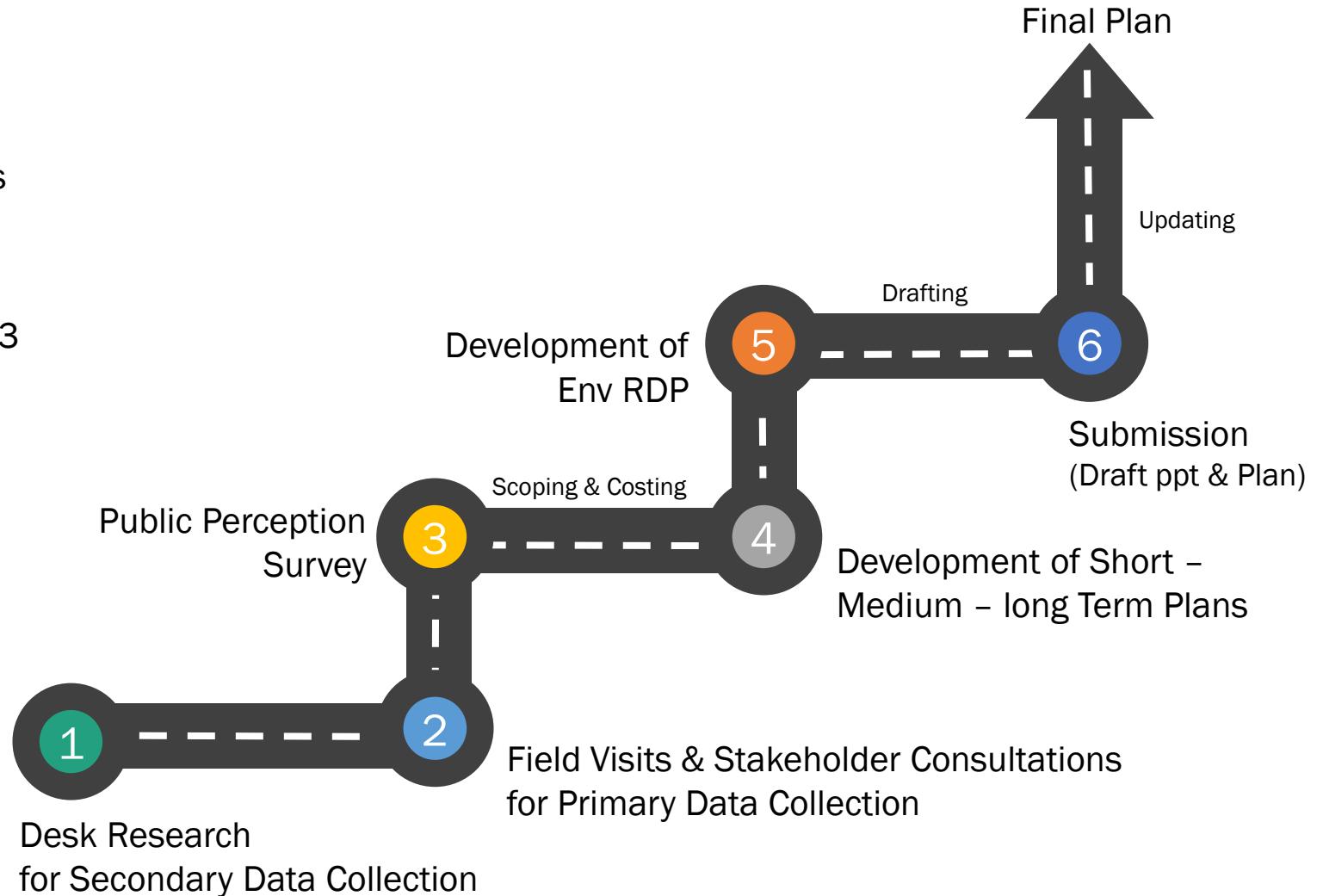
# Approach & Methodology – Sahiwal Region

 **Project Team**  
 **09** Field Members  
 **04** Research Members

 **Field Visits**  
Inception Visit: 10<sup>th</sup> – 11<sup>th</sup> Dec, 2023  
Field Visit: 2<sup>nd</sup> Jan – 7<sup>th</sup> Jan, 2024

 **Working Days**  
Total: 180  
Field Days: 80  
Office Days: 100

 **Deliverable**  
Sahiwal Regional Development Plan – **Environment and Biodiversity**



# Stakeholder's Consultation (Total 20+)



AD Wildlife, Sahiwal



DD Development, Sahiwal



Wildlife Officials, Okara



Wildlife Office, Pakpattan



MC Office Arifwala



RFO, Okara



CO - MC Depalpur



DG - PHA, Arifwala



EPD, Okara



Fisheries Dept. Pakpattan



Fisheries Office Arifwala



DD Development Okara



AD - EPA, Sahiwal



Chief MC, Chichawatni



CO MC Pakpattan

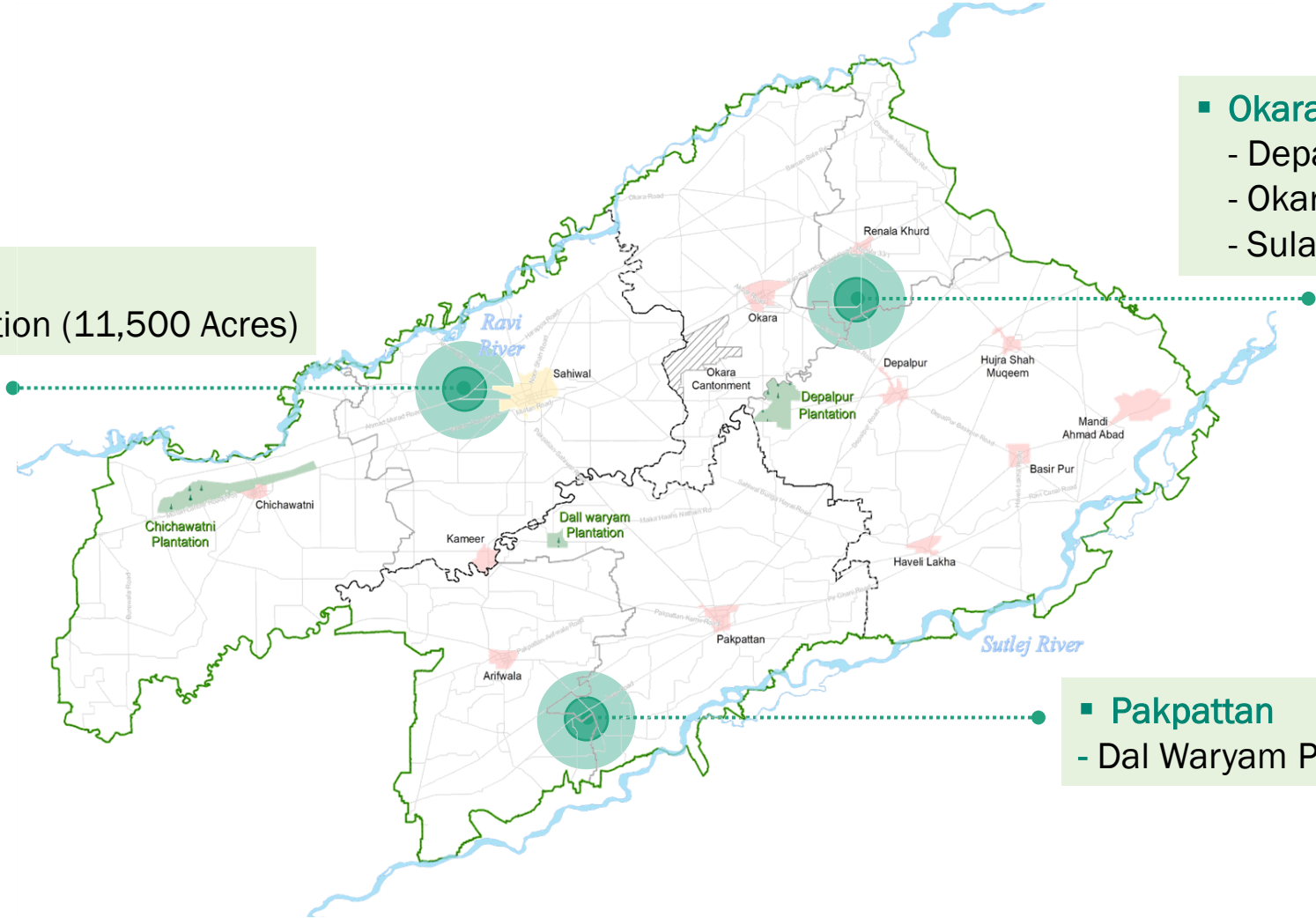
# Field Visit & Public Perception Survey – Sahiwal Region



# Environmental Sensitivity & High Conservation Value Areas

Total Sites visited: **05**

- **Sahiwal**
- Chichawatni Plantation (11,500 Acres)



- **Okara**
- Depalpur Plantation (6870 Acres)
- Okara Zoo (25 Acres)
- Sulaimanki Wildlife Park (28 Acres)

- **Pakpattan**
- Dal Waryam Plantation (1576.19 Acres)

# Biodiversity Assessment – Forest & Wildlife

## Depalpur Plantation, Okara

### Observation

- 6151 Acres Planted – compartment plantation.
- Some compartments have monoculture plantations dominated by *Eucalyptus*.
- 1474 Areas Plantable blank and low-density areas.
- Forest Plantations experiencing irrigation problems which affect the vigour of plants.
- 300 acres of land identified for afforestation and reforestation



Mixed Plantation  
Depalpur Plantation

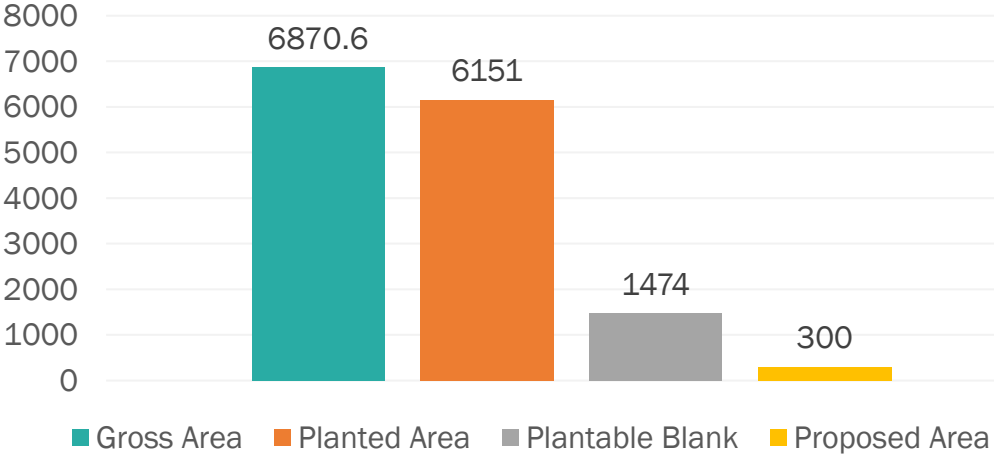


Blank Area  
Depalpur Plantation



Head Sulaimanki  
Wildlife Park

Depalpur Plantation Forest Area Analysis



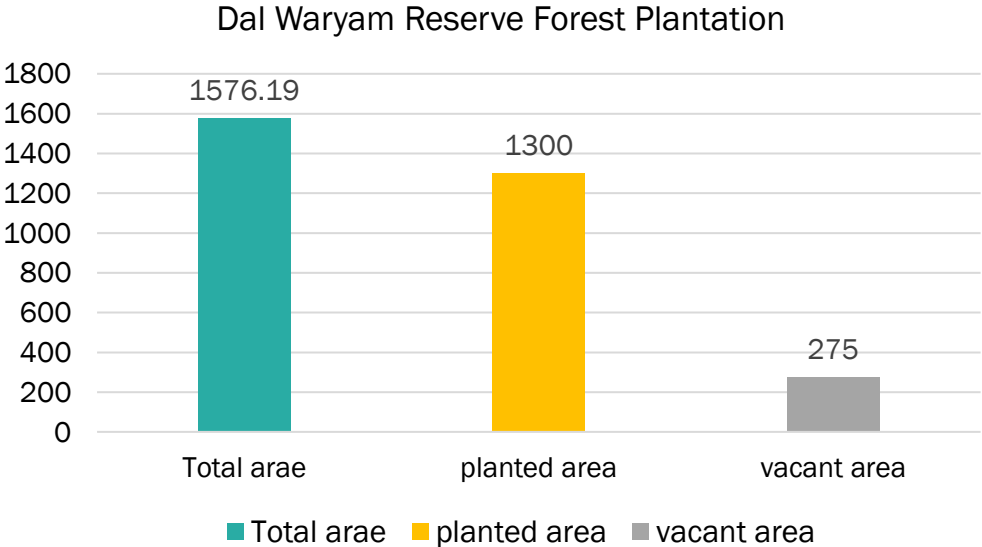
Soil Sampling by using Soil  
Corer

# Biodiversity Assessment – Forest & Wildlife

## Dal Waryam Reserve Forest Pakpattan

### Observation

- Plantation Type: Mixed Plantation
- Plants: Shisham, Mulberry, kikar, Sufaida, Bakain, Ber, Pipli, Sambal, Arjun tree, Red Pencil Tree, Siris tree(Safed siris), bottle brush, Neem, dodder, Chulai, Khabbal, *Chenopodium album*, *Calotropis procera*, Akk plant, *Bombax ceiba* (Simbhal)
- Animals: Grey francolin, Black francolin, hariyal bird, Jackal, Indian Dove, dark bellied marsh snake, Cobra Snake, Wild Hare



Red Pencil Tree



Bottle Brush



Ber



Simbhal



Mix Plantation



Shisham



Poly Bag Nursery



*Acacia nilotica* (Kikar)



*Cuscuta reflexa* (Dodder)

# Air Quality Assessment – Sahiwal Region

**Industrial Units – 3,030**

1,044 units – **Sahiwal**

904 units – **Okara**

266 units – **Pakpattan**

Source: Census of Manufacturing Industries 2015-16

**Registered Vehicles – 997,168**

498,455 – **Sahiwal**

361,653 – **Okara**

137,060 – **Pakpattan**

Registered vehicles by June 2021 – Bureau of Statistics Punjab

## Major Pollution Sources

Vehicular Pollution, Brick Kilns stack emissions, Waste Burning, Crop Residue Burning, Construction dust, fugitive dust, Sugar Mills and Traffic Congestion

**Brick Kilns – 656**

300 – **Sahiwal**

310 – **Okara**

303 – **Pakpattan**

Source: Brick Kilns Dashboard, The Urban Unit

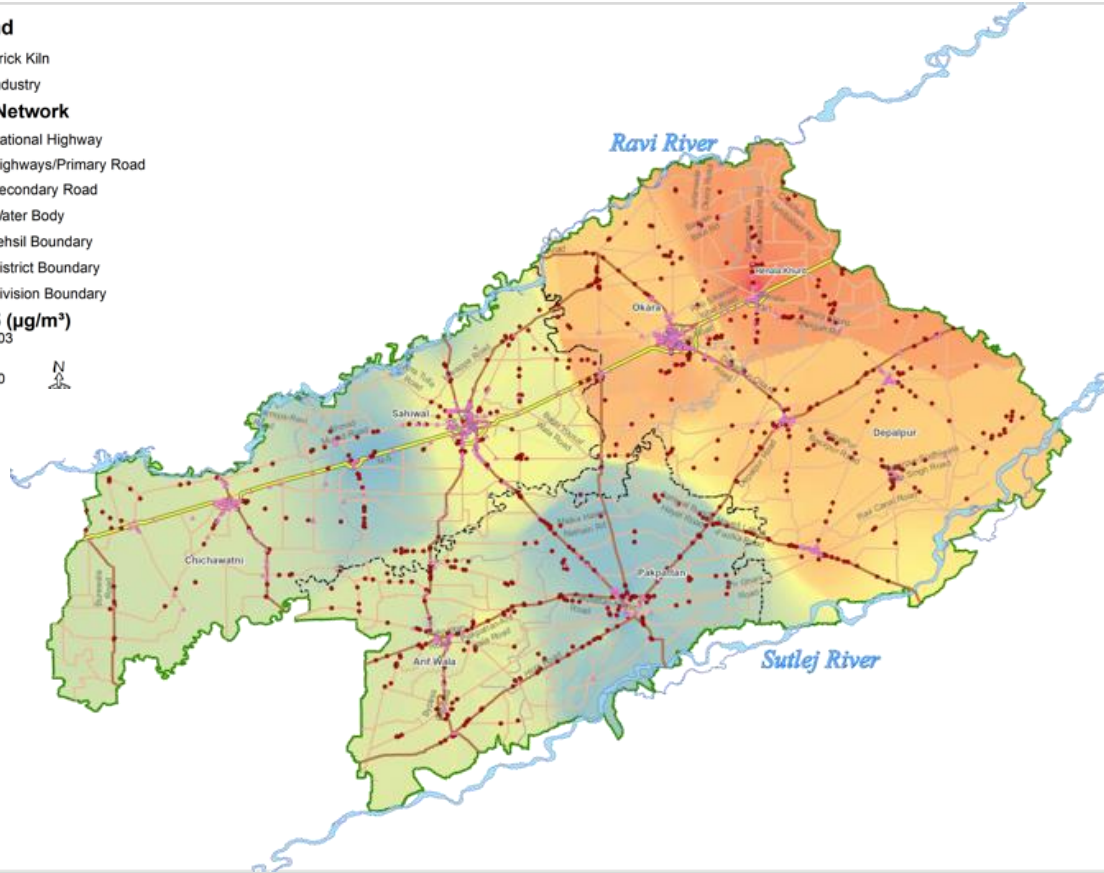
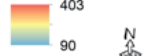


# Air Quality Assessment – Sahiwal Region (Field Survey)

## Legend

- Brick Kiln
  - Industry
- ### Road Network
- National Highway
  - Highways/Primary Road
  - Secondary Road
  - Water Body
  - Tehsil Boundary
  - District Boundary
  - Division Boundary

## PM 2.5 ( $\mu\text{g}/\text{m}^3$ )



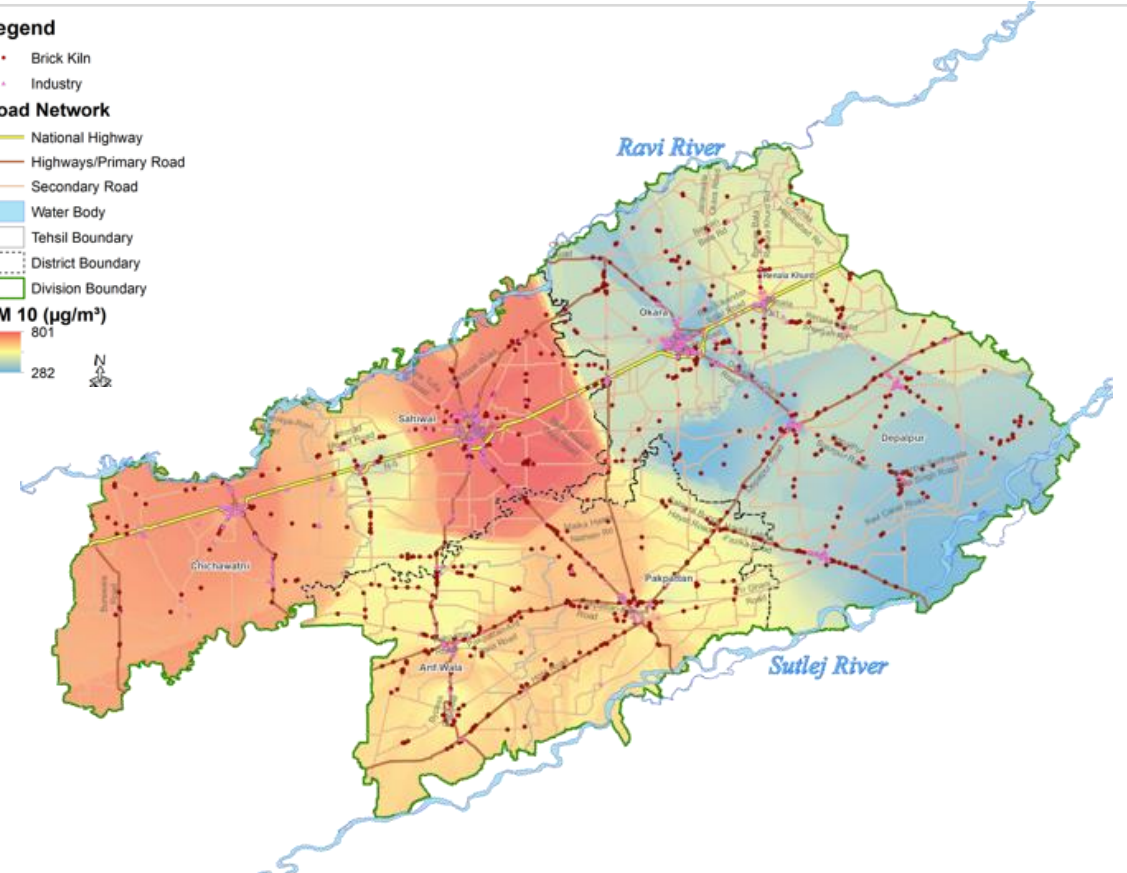
## PM<sub>2.5</sub>:

- North-eastern border particularly have higher concentrations
- Sources:** Presence of industrial Units in Okara district, brick kilns, road-side dust, Vehicular emissions.

## Legend

- Brick Kiln
  - Industry
- ### Road Network
- National Highway
  - Highways/Primary Road
  - Secondary Road
  - Water Body
  - Tehsil Boundary
  - District Boundary
  - Division Boundary

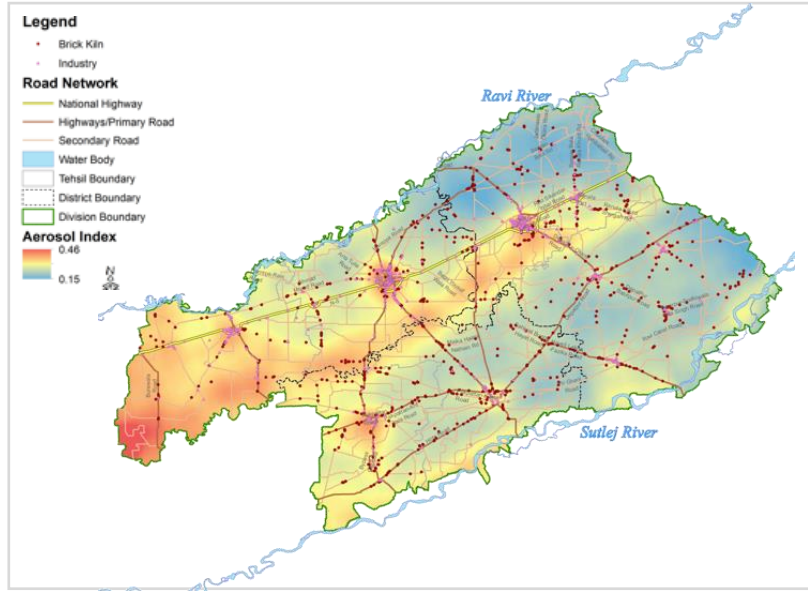
## PM 10 ( $\mu\text{g}/\text{m}^3$ )



## PM<sub>10</sub>:

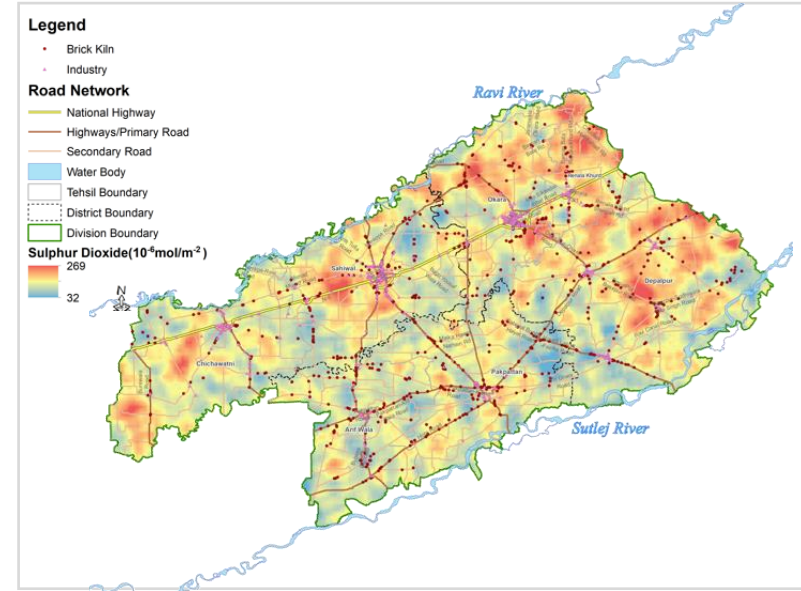
- Western and southern borders particularly have higher concentrations
- Sources:** Biomass burning, Industrial units in Sahiwal district, road-side dust, Vehicular emissions.

# Air Quality Assessment – Sahiwal Region (Satellite data)



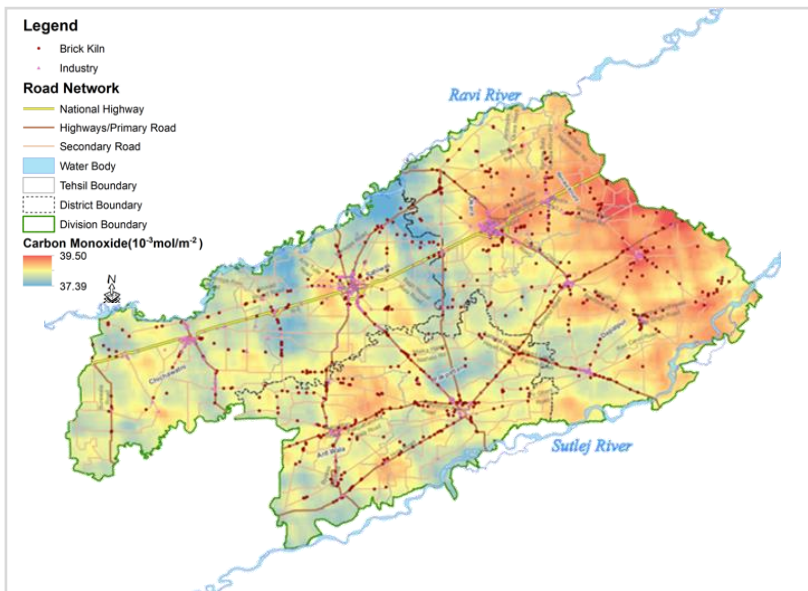
## Aerosol Index, 2022

- South-west higher concentration
- Emissions from Industrial clusters & brick kilns,.



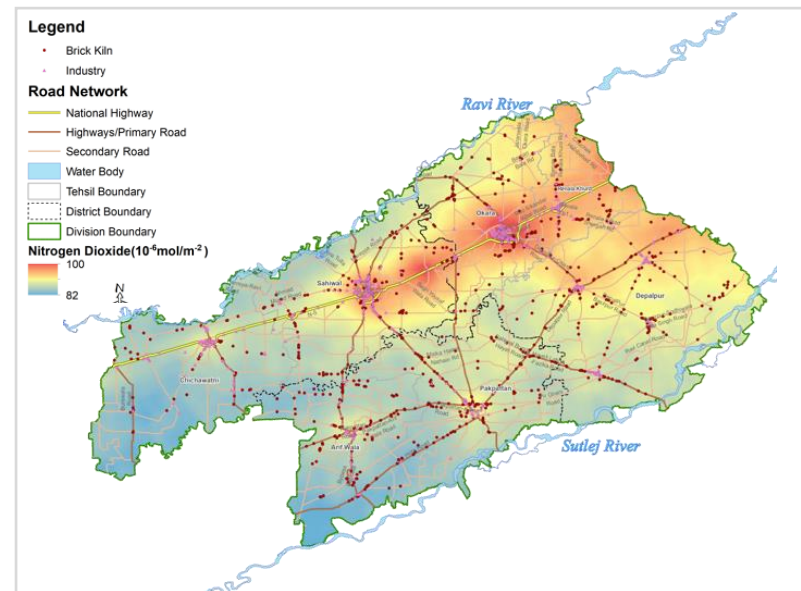
## SO<sub>2</sub>, 2022

- Higher concentration throughout the Region
- Biomass burning, Industrial emission, Traffic congestion.



## CO, 2022

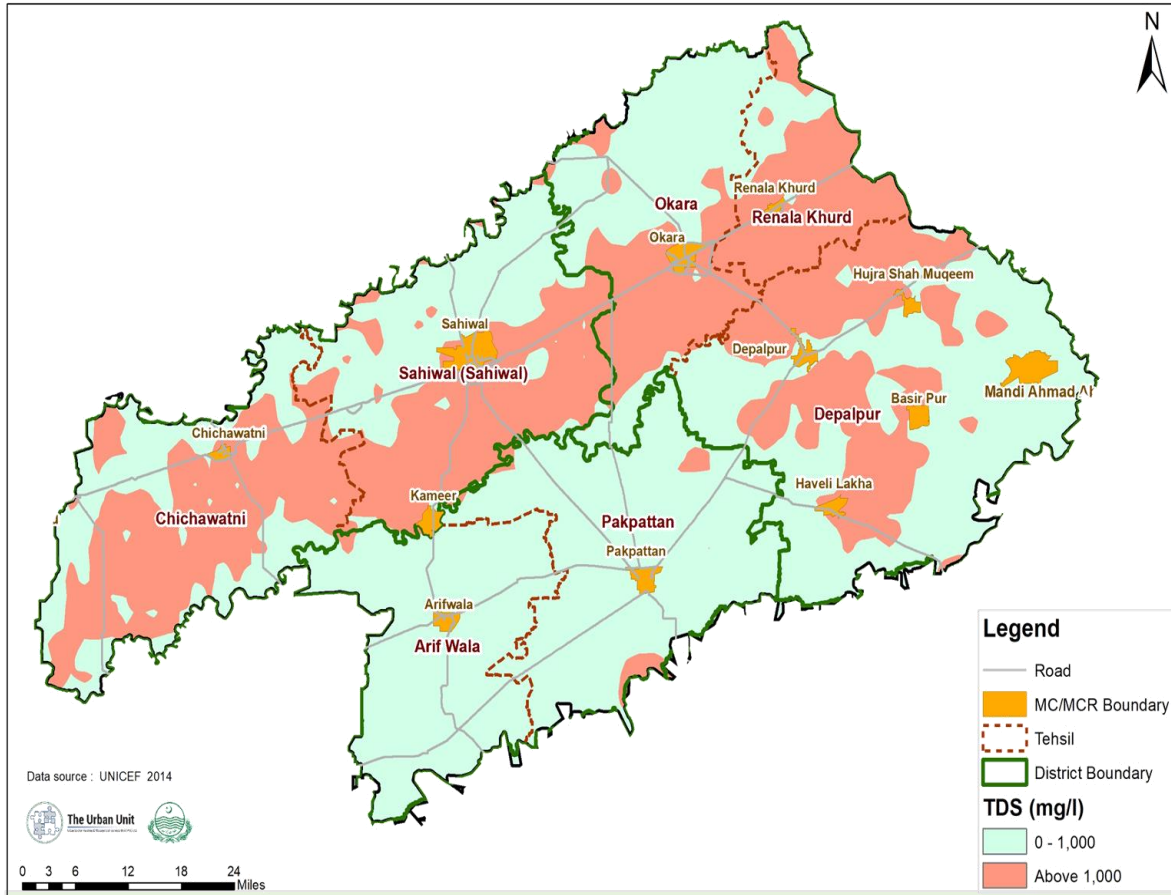
- South-east and Northern borders have higher concentration.
- Traffic congestion, Industrial units



## NO<sub>2</sub>, 2022

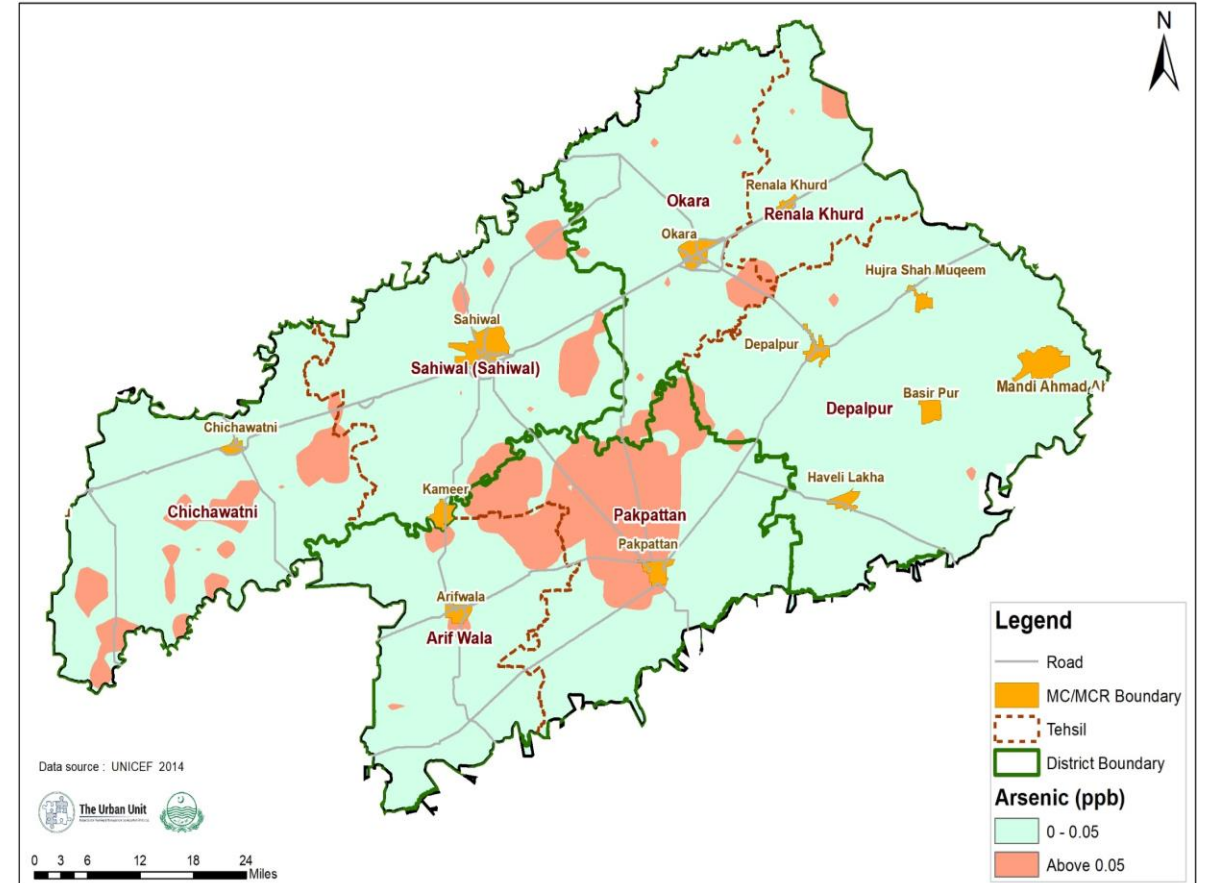
- Northern border have higher concentration
- Emissions from Industrial clusters & brick kilns, domestic activities.

# Water Quality Assessment – Sahiwal Region



## TDS Concentration:

- Elevated concentrations in localized areas across the Sahiwal region
- **Sources:** Sewage, urban run-off, industrial wastewater, and runoff of chemicals from fertilizers used in agriculture fields.

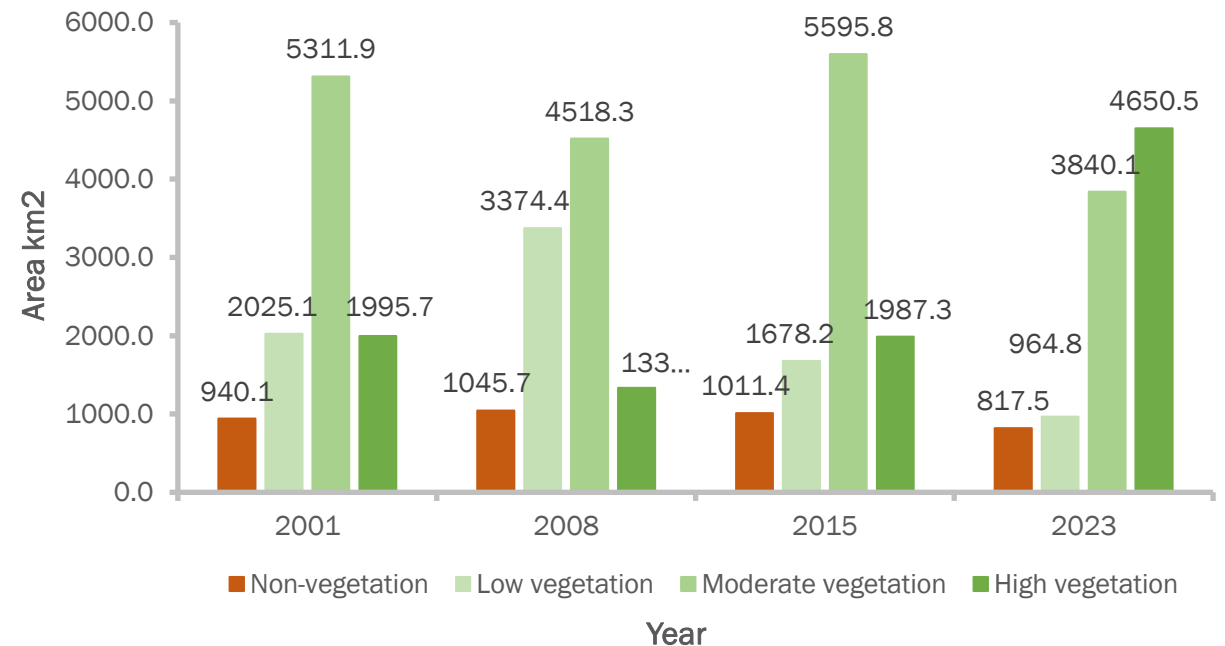


## Arsenic Concentration:

- Elevated concentrations in Pakpattan and Chichawatni Districts
- **Sources:** Untreated industrial wastewater discharge, leather tanneries effluent discharge, and excessive use of fertilizers in fields for crops production.

# Spatial Trends (Changes in Green Spaces)

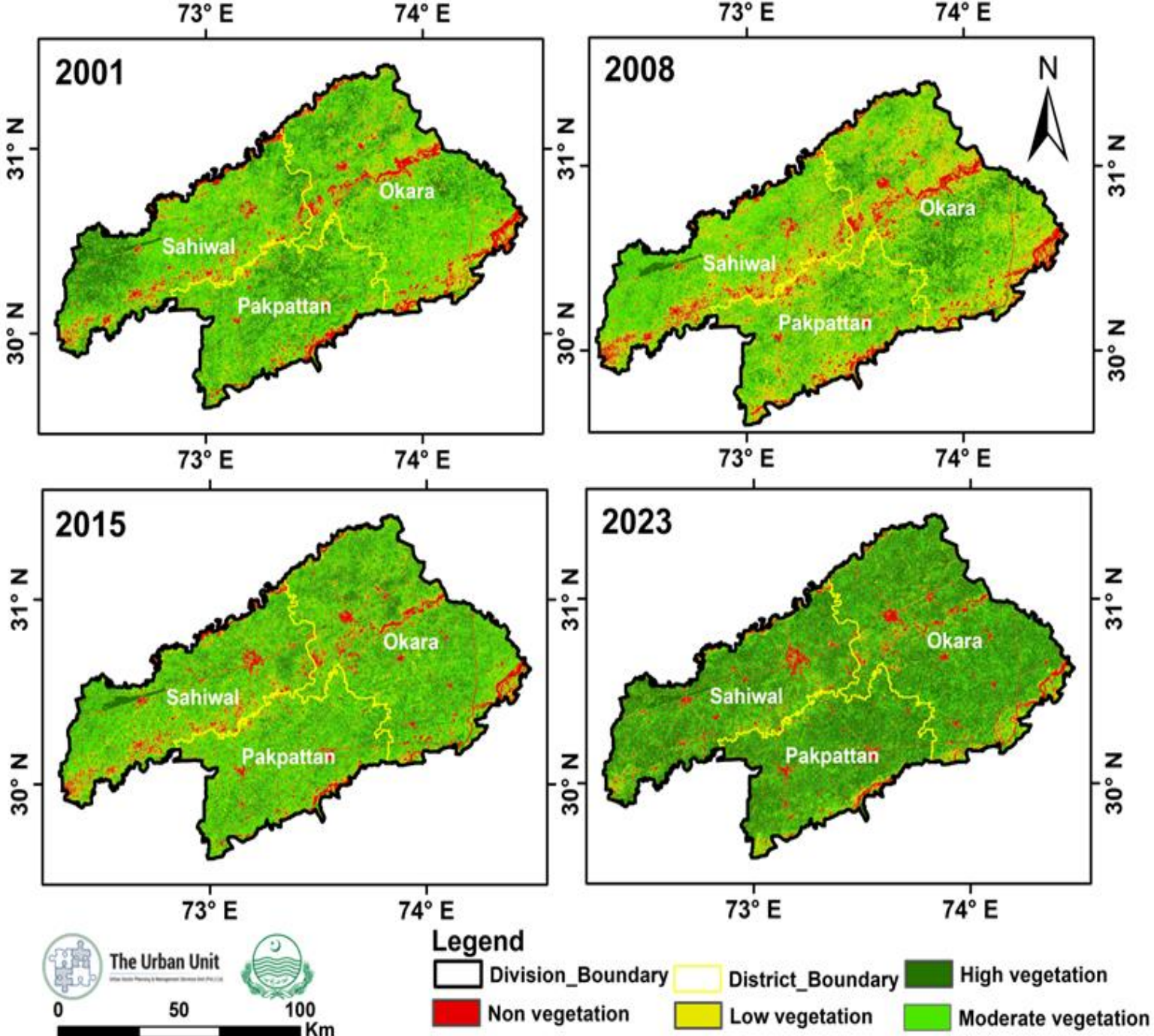
- Spatial pattern of vegetation dynamics of Sahiwal Region derived from Satellite **LANDSAT**, (30m spatial resolution) during 2001 to 2023.
- NDVI is an indicator aimed at assessing the vegetation in the land through the use of remote sensing.
- NDVI extracted from Satellite **Landsat 5 TM**, **Landsat 7 ETM+** and **Landsat 8 OLI** dataset.
- Mean yearly NDVI was analyzed to comprehend the vegetation dynamics among different years.



Area statistics among two different vegetation (between 2001 – 2023)

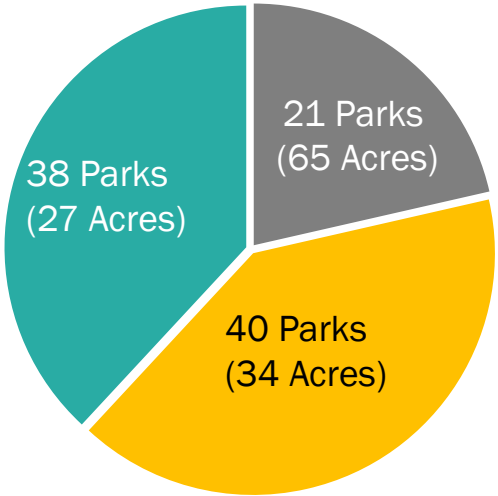
Change Detection During Three Time Intervals			
NDVI Threshold Values	2001-2008	2008-2015	2016-2023
Non-vegetation	↑ 105.6	↓ -34.3	↓ -193.9
Low Vegetation; 0.1–0.3 (grassland, sparsely distributed vegetation)	↑ 1349.4	↓ -1696.2	↓ -713.5
Moderate Vegetation; 0.3–0.5 (Shrubs)	↓ -793.6	↑ 1077.5	↓ -1755.8
High Vegetation; <0.5 (Healthy & dense vegetation)	↓ -661.4	↑ 653.0	↑ 2663.2

# Spatial Trends (Changes in Green Spaces)

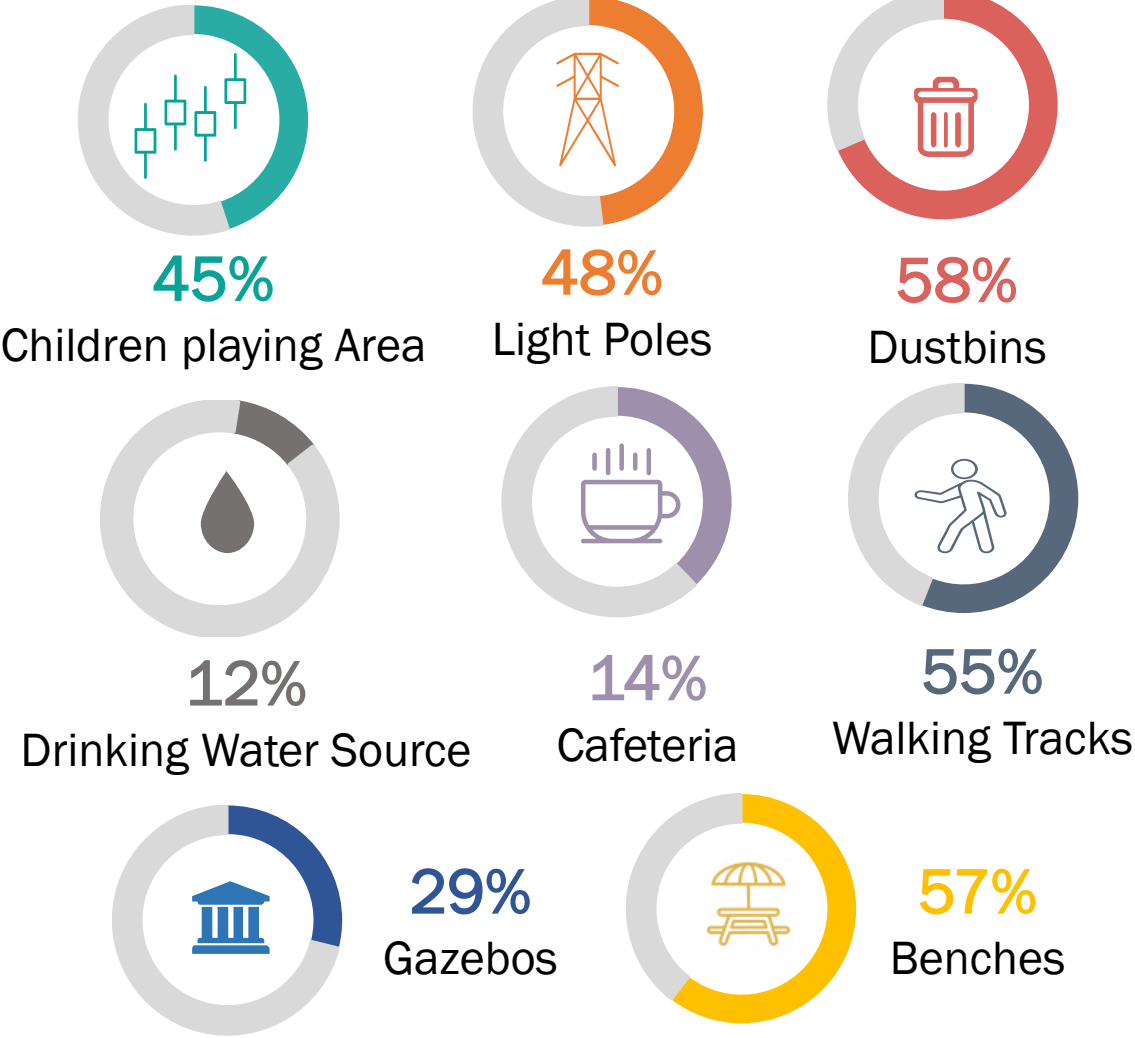


# Parks Assessment – Sahiwal Region

**42** total surveyed Parks



## Facilities Available



Undeveloped park



Lack of Amenities



Poor Maintenance

# Public Perception Survey – Sahiwal Region

## Demographics

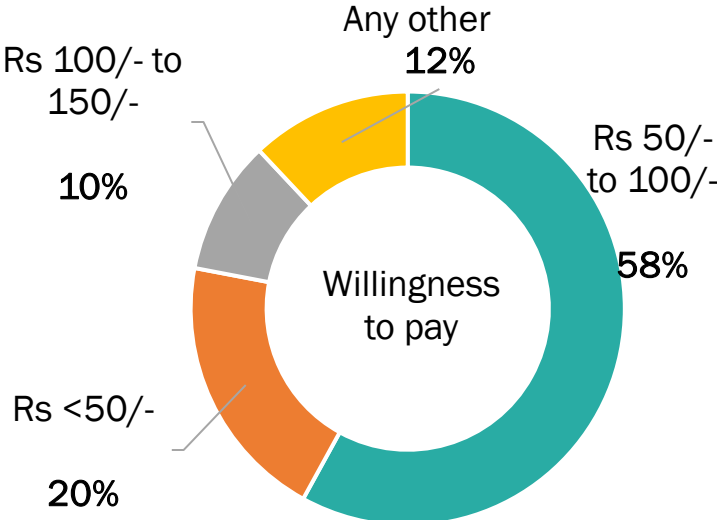
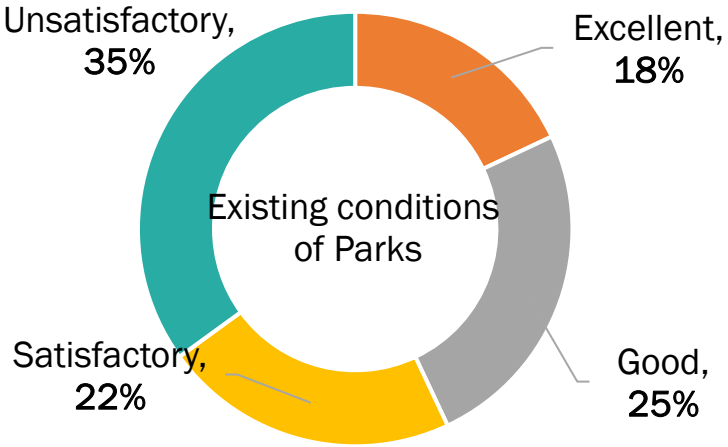
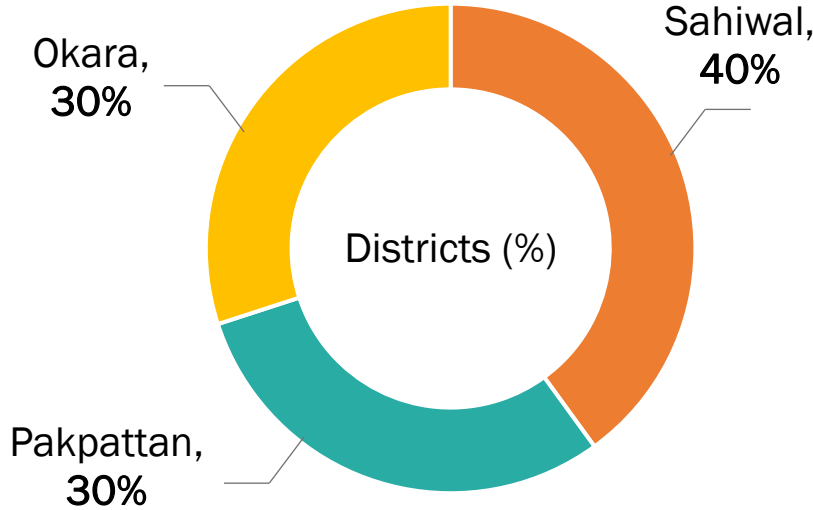
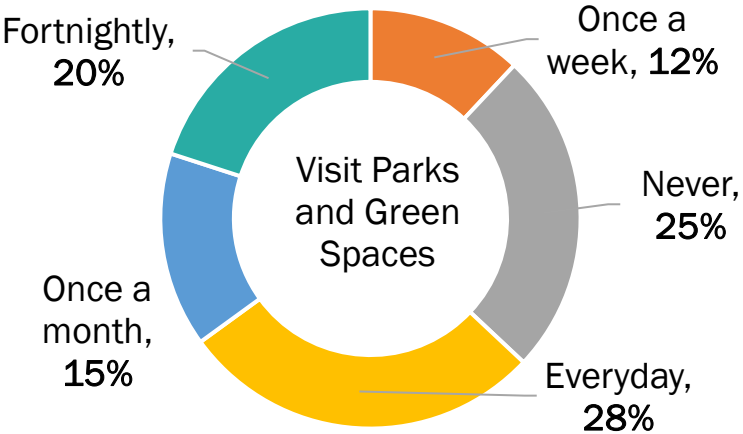
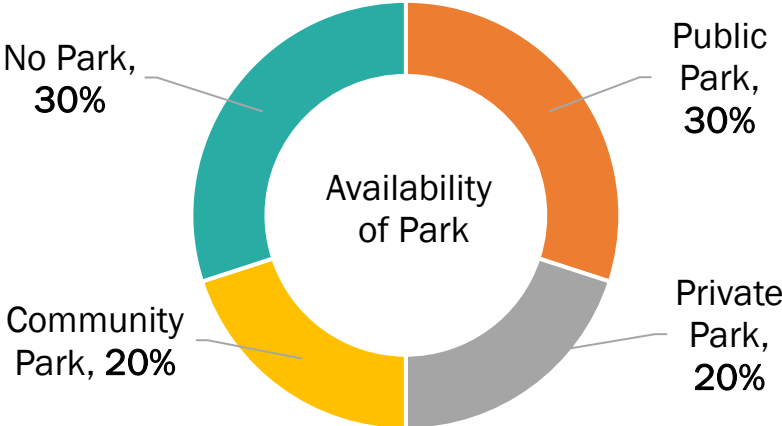
25%  
Females



75%  
Male



## Parks Assessment



# Key Environmental Issues & Challenges (Field Visit & Public Perception)



100 respondents (75 males; 25 females)

considered:

- 28 % - Limited Green Spaces
- 22 % - Waste Burning & open dumping
- 20 % - Air Pollution and Smog
- 18 % - Water Contamination
- 12 % - Noise Pollution



## Parks & Green Spaces

- Lack of Green Spaces
- Illegal Cutting of Forests and Trees for Agriculture Farming



## Biomass Burning

- Burning of crop residue in the fields around the cities.



## Waste Dumping

- Open Dumping of waste alongside roads due to lack of landfill sites..



## Air Pollution

- No Air Quality Monitoring System.
- Industrial Estates, brick kilns, Unpaved roads. Traffic congestion, vehicle emission.



## Water Contamination

- Surface and drinking water pollution due to lack of sanitation facilities as well as dumping of solid waste alongside the road



## Noise Pollution & Traffic Congestion

- Lack of traffic management, Roadside Dust, Two-stroke Vehicles

# Biodiversity Survey (Protected Areas Status)

- Compartment wise mixed indigenous plantation across the region to conserve and restore natural habitat.
- Sulainmanki Wildlife park is key ex-situ breeding ground to threatened species and have ecotourism potential.
- Depalpur Plantation and Chichawatni forest provides habitat to key wildlife Species includes Wild hare, wild boar, porcupine, jackal, Snakes etc.
- Sulainmanki Wildlife captive breeding increasing the population size of animals.

## STRENGTH

## WEAKNESS

- Illegal activities like hunting of Grey partridges and wild hare.
- Illegal cutting of trees due to lack of community awareness.
- Water unavailability for forest plantation in Okara district leads to decline of green cover.
- Missing recreation facilities in Sulemanki Wildlife park for visitors.
- Limited space for captive animals in Sulainmanki Wildlife Park increases the threats and competition among animals.
- Limited resource, HR and research activities across the region leading to the destruction of natural beauty.



# Biodiversity Survey (Conservation Sites Threats)

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**Illegal Hunting,**  
(e.g., Grey partridges and wild hare in Depalpur plantation and Dal Waryam Reserve Forest )



**Invasive Alien Flora**  
(e.g., *Prosopis juliflora* (musqad) in Sahiwal region



**Forest Cutting by local community**  
(e.g., Simbal, kikar, Shisham in Dal Waryam Reserve forest in Chichawatni plantation)



**Water Resources unavailability**  
(e.g., in Depalpur forest plantation, Okara)







**Limited space for captive animals**  
(e.g., in Sulainmanki Wildlife Park)

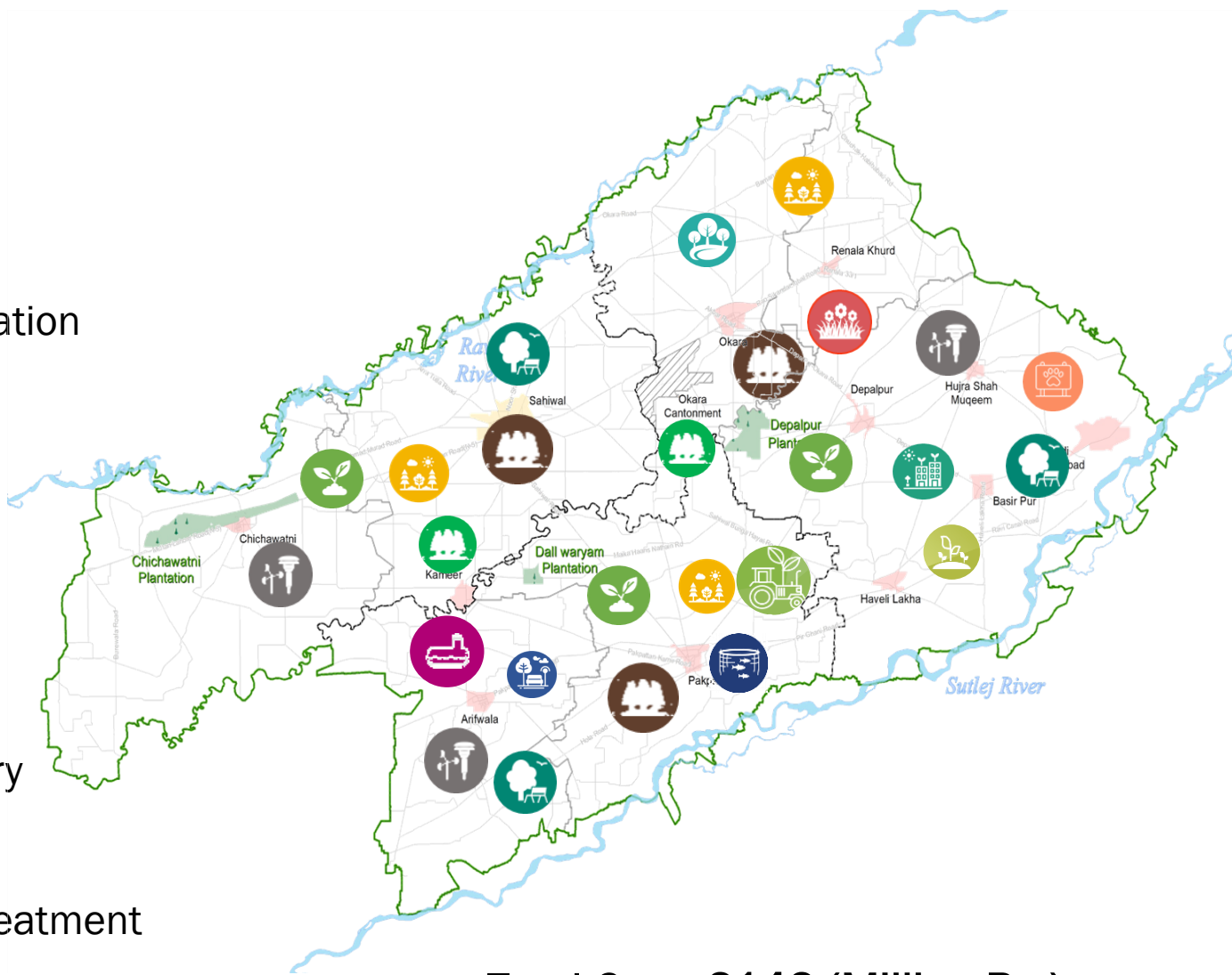
**Proposed**

**Interventions**

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# Proposed Interventions – Map

-  Eco – landscape along Okara Canal
-  Development & Rehabilitation of Parks
-  Aqua Nature Parks
-  Community Gardens
-  Sulemanki Wildlife Park – Extension & Rehabilitation
-  Forest Sprouting Reserve
-  Agro Canopy Forest
-  Reforestation – Afforestation
-  Linear Plantation
-  Pathway Lineage Park
-  Zero Water Discharge RAS Aquaculture Hatchery
-  Forest Plantation
-  Installation of Phytoplankton based Floating treatment Wetland (FTW) on wastewater Pond
-  Installation of Air Quality Monitoring Equipment



**Total Cost: 2142 (Million Rs.)**  
**Short-Term Cost: 929 (Million Rs.)**

# Proposed Intervention

## 1. Eco-Landscape along Okara Canal

### Area:

**Location:** Okara City (Along Lower Bari Doab Canal)

**Length:** 3 kilometers within City Boundary

**Width:** 50 feet

### Components:

- Walkway Pavement
- Gazebo
- Plantation & Trees
- Fencing
- Light Poles

### Benefits:

- Ecological Corridors are significant for increasing interaction between humans and local biodiversity creating a sense of awareness and responsibility for the protection of the local environment.
- It also enables the promotion, restoration, and protection of the indigenous fauna and flora, while regulating the micro-climate of an urban center.




Existing Condition of proposed site

# CONCEPTUAL DESIGN FOR ECO-LANDSCAPE ALONG OKARA CANAL

## Ecological Corridor Along Okara Canal

3 km Length, 50 feet Width

### Legend

 Canal



Walkways & Landscaping



Wooden Gazebos



Human Ecology Interactions

Google Earth

Image © 2024 Airbus

3000 ft



# Proposed Intervention

## 2. Development & Restoration of Parks

### Development of new Parks:

- 02 Parks – Sahiwal District
- 05 Parks – Okara District
- 03 Parks – Pakpattan District

### Restoration & Improvement of Parks:

- 07 Parks – Sahiwal District
- 13 Parks – Okara District
- 04 Parks – Pakpattan District

### Scope:

- Children’s Play Area
- Gazebo
- Walking Track & Pathways
- Drinking Water faucets
- Fountains
- Rest areas/washrooms
- Parking area
- Cafeteria
- Benches
- Toilets

### Benefits

- Provision of Improved Ecosystem Services
- Air and Water Purification
- Carbon Sequestration
- Climate Regulation
- Habitat for Local Biodiversity
- Human-Biodiversity Interactions

### Development of new Parks:

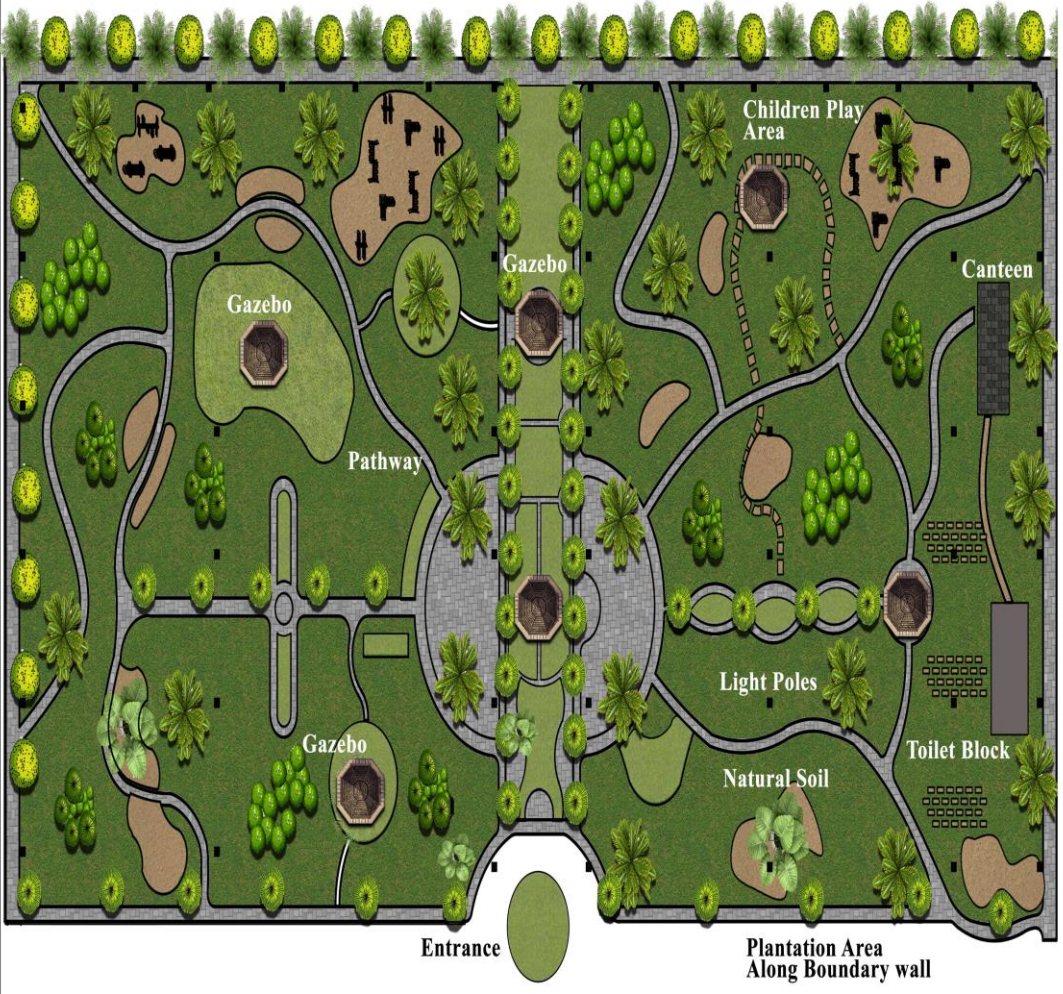
1. Bada Faridya Park Arifwala (30.4591966, 73.1503049) 0.5 Acre
2. DC Office Park (30.360754, 73.380887) 3.2 Acres
3. Gulshan e Iqbal Park (30.281116, 73.06814833) 1 Acre
4. Children Park (30.877706, 73.592555) 1 Acre
5. Fatima Public Park (30.83011997, 73.45158287) 2 Acres
6. Pakistan Public Park (30.83068694, 73.4517363) 3 Acres
7. Sher-e-Rabbani Town Park (30.8082164, 73.45380232) 0.27 Acre
8. Disposal Plant Park Depalpur (30.66340248, 73.65601629) 0.65 Acre
9. Tainki Wala Park (30.402656, 73.044776) 3.5 Acres
10. Saleem Akhtar Shaheed Park (30.404943, 73.051463) 3.5 Acres
11. Disposal Plant Park Renala Khurd (30.87004971, 73.59315228) 2 Acres

### Restoration & Improvement of Parks:

1. Ladies Park (30.36338693, 73.38073308) 0.5 Acre
2. MC Park (30.348331, 73.386551) 2 Acres
3. Muslim Town Park 1 (30.871828, 73.598441) 1 Acre
4. Muslim Town Park 2 (30.872919, 73.598516) 2 Acres
5. Muslim Town Park 3 (30.870876, 73.598442) 0.7 Acre
6. Fatima Jinnah Park Depalpur (30.67003883, 73.65620313) 0.7 Acre
7. Garden Town Park Okara (30.80174978, 73.44059838) 1.5 Acres
8. Abu Bakr Sadiq Park (30.8217938, 73.4535675) 0.28 Acre
9. Government Colony Park Okara (30.81707219, 73.4658394) 2.3 Acres
10. Sher-e-Rabbani Town Park (30.8082164, 73.45380232) 0.27 Acre
11. Faisal Colony Park 2 (30.82202008, 73.45645348) 0.45 Acre
12. Arooba Park (30.312073, 72.410356) 0.63 Acre
13. Zainab Park (30.522888, 72.684389) 0.57 Acre
14. Fatima Jinnah Park Chichawatni (30.403128, 73.071978) 2 Acres
15. Park Traiq Bin Ziad Colony (30.403128, 73.071978) 1.5 Acres
16. Hazoori Park (30.39474, 73.079602) 5 Acres
17. Masjid Sisddiq Akbar Park (30.402316, 73.052135) 2 Acres
18. Sher Khan Park, Bilal Colony (30.400138, 73.073414) 3.5 Acres
19. Baba Fareed Park (30.364288, 73.379079) 3.5 Acres
20. Canal Park (30.36542211, 73.38446446) 1 Acre
21. Faisal Colony Park 2 (30.82202008, 73.45645348) 0.45 Acre
22. Ladies Park (30.312073, 72.410356) 1 Acre
23. Gulshan-e-Fatima Park (30.80434861, 73.44749735) 0.14 Acre

# CONCEPTUAL DESIGNS FOR DEVELOPMENT & RESTORATION OF PARKS

## CONCEPTUAL DESIGN FOR PUBLIC PARK



### Legends

- Green Area
- Pathway
- Natural Soil
- Toilet Block
- Canteen
- Green Area

### Plantation

- Acacia nilotica (Kikar)
- Morus Alba (Shahtoot)
- Cassia Fistula (Golden Shower)
- Ziziphus Nummularia (Beri)

### Site Image



Lat: 30°39'59.57"N  
 Long: 73° 7'30.76"E  
 Total Covered Area  
 1.60 Acre  
 District: Sahiwal

## CONCEPTUAL DESIGN FOR LADIES PARK



### Legends

- Green Area
- Pathway
- Natural Soil
- Toilet Block
- Canteen
- Green Area

### Plantation

- Acacia nilotica (Kikar)
- Morus Alba (Shahtoot)
- Cassia Fistula (Golden Shower)
- Ziziphus Nummularia (Beri)

### Site Image



Lat: 30°31'26.93"N  
 Long: 72°41'31.66"E  
 Total Covered Area  
 1.8 Acre

# Proposed Intervention

## 2.1. Aqua Nature Parks

### Locations:

- Fatima Jinnah park Arifwala (8.5 Acres)
- Baba Farid Park Pakpattan (3.5 Acres)
- Town Park Renala Khurd (5 Acres)

### Benefits:

- Provision of Improved Ecosystem Services
- Air and Water Purification
- Carbon Sequestration
- Climate Regulation
- Habitat for Local Biodiversity
- Storm water Infiltration

### Scope:

- Rain Garden
- Children’s Play Area
- Gazebo
- Walking Track & Pathways
- Drinking Water faucets
- Nursery (Town Park Renala Khurd
- Fountains
- Rest areas/washrooms
- Parking area
- Cafeteria
- Benches
- Toilets



Existing Condition of proposed project sites



Google Earth

Image © 2024 Airbus

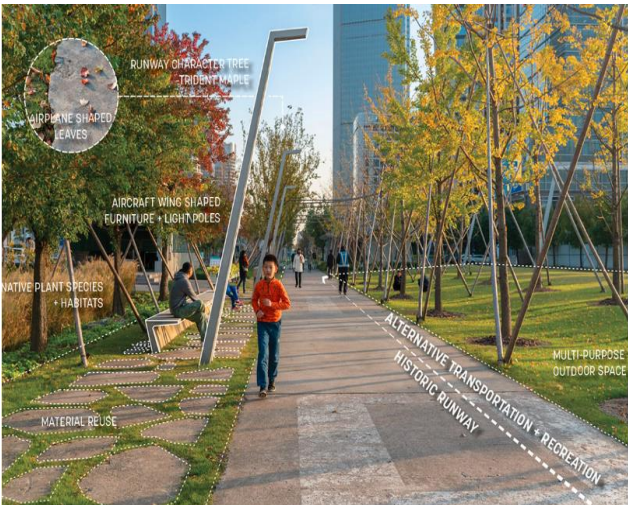
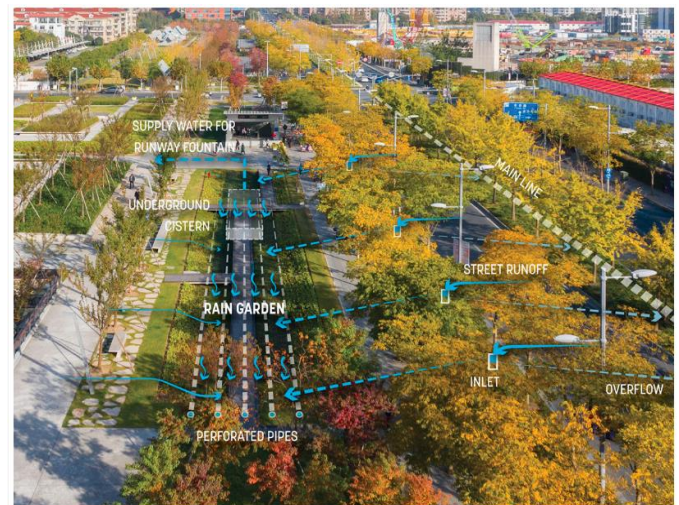
400 ft



Google Earth

Image © 2024 Airbus

300 ft



Water Inflow Concept: Central rain garden with walkways on the side



Gazebo



Children Play Area




Fountains

# Town Park Renala Khurd

Rehabilitation & Extension: 1.80 Acres

## Legend

 Town Park Renala Khurd



Sensory Garden



Gazebo



Wooden Walkway



Nursery

Google Earth

Image © 2020 Airbus

200 ft



# Proposed Intervention

## 2.2 Community Gardens

- Al-Abbas Park Depalpur (2 Acres)-30.66355419, 73.66225573
- Quaid-e-Azam Chowk Green Belt (80 ft. long, 15 ft. wide) - 30.672356, 73.657550
- Traditionally, community gardens in urban centers are used by locals for producing fresh vegetables which enables a healthier sense of community and increased community well-being.
- Under this project, the MC can plant indigenous species of pollution tolerant plants. Locals can be engaged through plantation campaigns such as “Jashn-e-Bahran to help plantation.

### Components:

- Gazebo
- Vertical & Horizontal Greening
- Small-sized Plots for plantation
- Vertical greening on side fence and back fence
- Light Poles
- Fencing

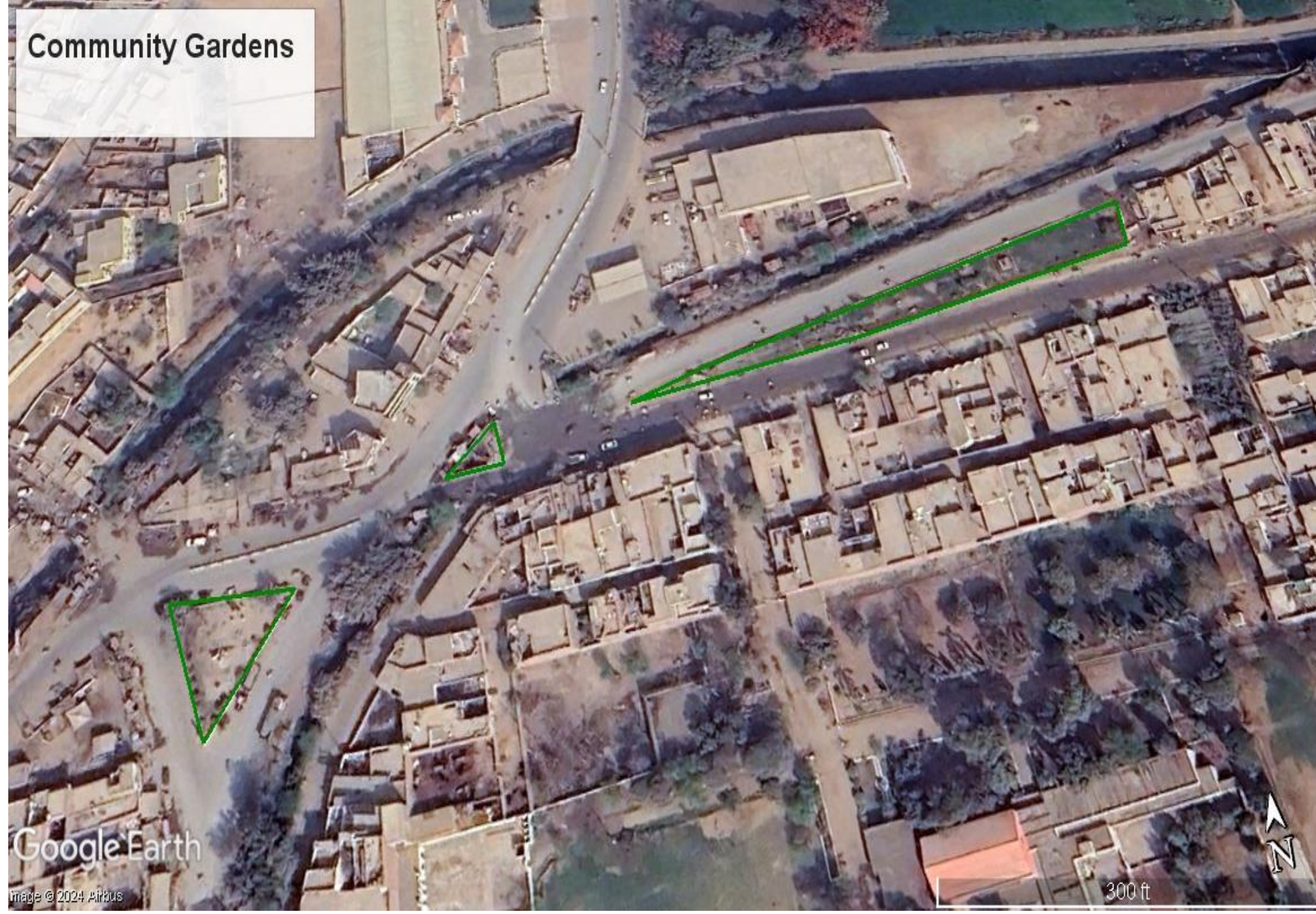
### Benefits:

- Provision of Improved Ecosystem Services
- Air Purification
- Carbon Sequestration
- Climate Regulation
- Habitat for Local Biodiversity
- Sense of Community
- Improved local environment



Existing Condition of proposed project sites

# Community Gardens



Vertical Greening



Small-Sized Plots



Gazebo







Google Earth

Image © 2024 Airbus

300 ft

# CONCEPTUAL DESIGN FOR COMMUNITY GARDEN

## Legends

- Green Area 
- Pathway 
- Natural Soil 
- Toilet Block 
- Canteen 
- Green Area 

## Plantation

- Acacia nilotica (Kikar) 
- Morus Alba (Shahtoot) 
- Cassia Fistula (Golden Shower) 
- Ziziphus Nummularia (Beri) 

## Site Image



Lat: 30°49'50.96"N  
 Long: 73°27'4.08"E  
**Total Covered Area**  
**0.8 Acre**



# Proposed Intervention

## 3. Sulemanki Wildlife Park – Extension & Rehabilitation

### Area:

- Head Sulaimanki Wildlife Park

### Scope of Work:

- Provision of Recreational Facilities
- Improved the social forestry
- Improved Ecosystem Services
- Climate change mitigation
- Improved human-biodiversity interaction

### Conceptual Design

- Information Center
- Admin Block
- Animal Enclosure
- Veterinary Office
- Cafeteria
- Bird Aviary
- Gazebos & Recreational Facilities
- Mixed Indigenous Plantation



Bird Cages  
Ring-necked Pheasant



Existing Gazebos  
Sulemanki Wildlife Park



Captive Animals  
Nilgai



Existing Vegetation Condition  
Sulemanki Wildlife Park



**Bird Aviary**



**Gazebo & Bird Watch Tower**



**Enclosure & Benches**



**Information center**

# Proposed Interventions

## 4. Forest Sprouting Reserve

### Proposed Sites

Along Canal Nearby Urban Area, Okara

- Location 1: 73.497996°, 30.836229° (Area:6.7 acres)
- Location 2: 73.424759°, 30.823106° (Area: 4.8 acres)

### Conceptual Design

- Bed and pocket sowing and planting technique.
- Indigenous species through seed or cutting.
- Ornamental plant species through cutting.

### Objective

- Raised Sapling of Slow growing Plant Species.
- Produced diseased Free sapling.
- Raised Stock for Reforestation.
- Increase vigour and viability by lower competition.
- Promote social forestry.
- Improves environment stability.




Pocket Sowing Technique



Bed Sowing and Planting Technique

# CONCEPTUAL DESIGN FOR FOREST SPROUTING RESERVE

## Legends

Green Area 

Pathway 


Natural Soil 

Green Area 


Green Area 


## Plantation

Acacia nilotica (Kikar) 


Rose Indica (Rose) 

Cassia Fistula (Golden Shower) 

Ziziphus Nummularia (Beri) 

Morus Alba (Shahtoot) 

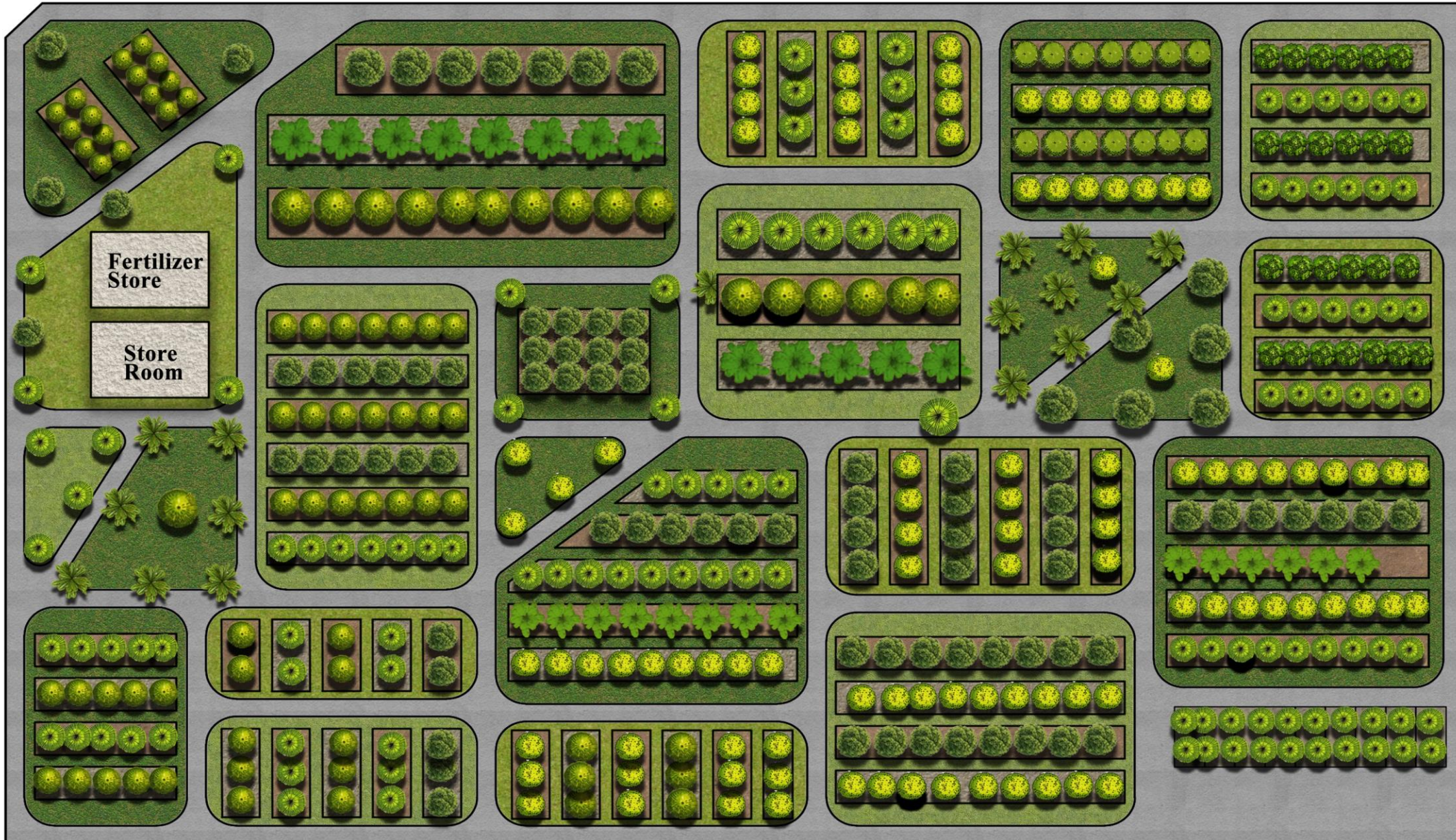
Heptapleurum arboricola (Dwarf Umberalla) 

Jasminam Sombac (Jasmine) 

## Site Image



Lat: 30°49'22.42"N  
Long: 73°25'26.71"E



# Proposed Intervention – Forest & Wildlife

## 5. Agro Canopy Forest

### Proposed Sites

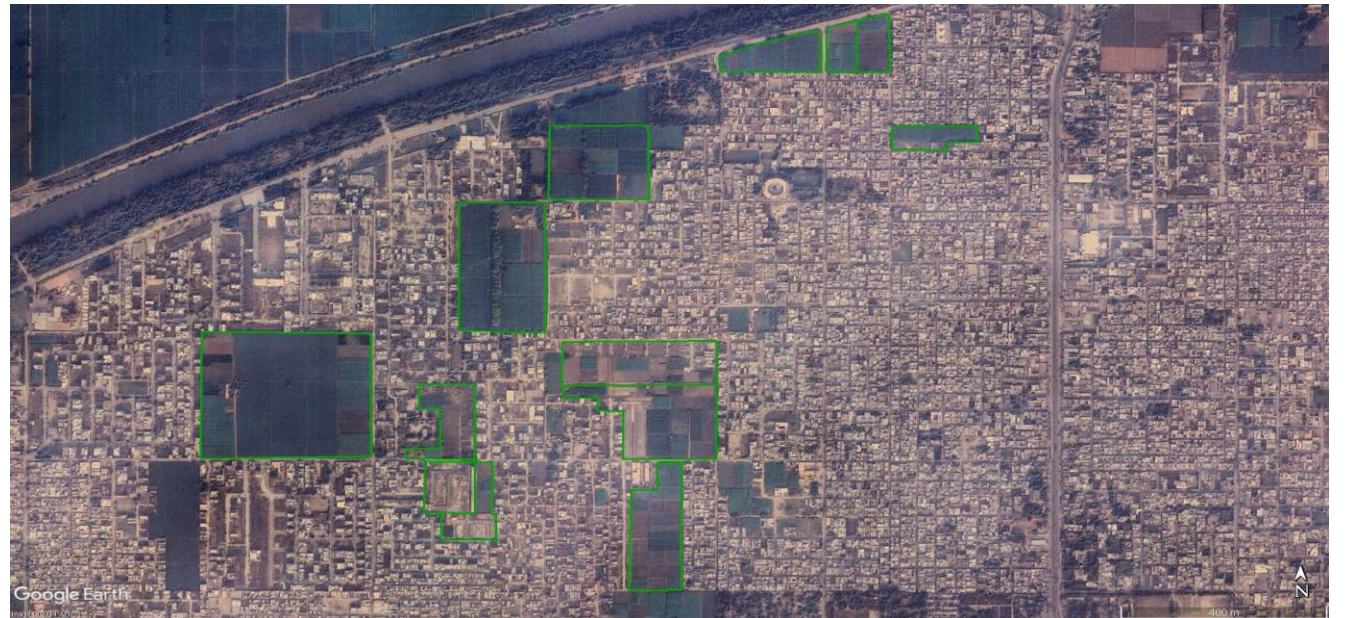
- Agricultural land Around the Urban Settlement, Okara

### Conceptual Design

- Peripheral Plantation
- Indigenous species
- Fruiting Plant species


### Objective


- Increase carbon sink.
- Mitigate climate change issues.
- Promote social forestry.
- Improves environment stability.
- Habitat to urban biodiversity.
- Act as Wind Barrier for field crops.





# CONCEPTUAL DESIGN FOR AGROCANOPY FOREST

## Legends


Green Area 


Agriculture land 

Agriculture land 

Agriculture land 

## Plantation

Acacia nilotica (Kikar) 

Morus Alba (Shahtoot) 

Cassia Fistula (Golden Shower) 

Ziziphus Nummularia (Beri) 

## Site Image



Lat: 30°49'19.83"N  
Long: 73°26'9.63"E



# Proposed Intervention – Rehabilitation of Forest Irrigation

## 6. Rehabilitation of Tube Wells at Depalpur Forest Plantation

- Total area of Plantation = 6,870 acres
- Currently Irrigated Area = 4,782 acres

### Sources of Water

- Tube Wells (21 Nos @3247 acres)
  - Functional Tube Wells (16 Nos @2202.7 acres)
  - Non Functional Tube Wells (5 Nos)
- Alwardi Minor Canal (15 Outlets)
  - Indented Discharge (58.14 cusecs @5188 acres)
  - Current Discharge (28.90 cusecs 2578.8 acres)

### Problematic Areas & Key Issues

- Non Irrigated Area = 896.9 acres
- Key Issues include but are not limited to:
  - Annual Canal (Only seasonal flows)
  - Energy related issues for TWs

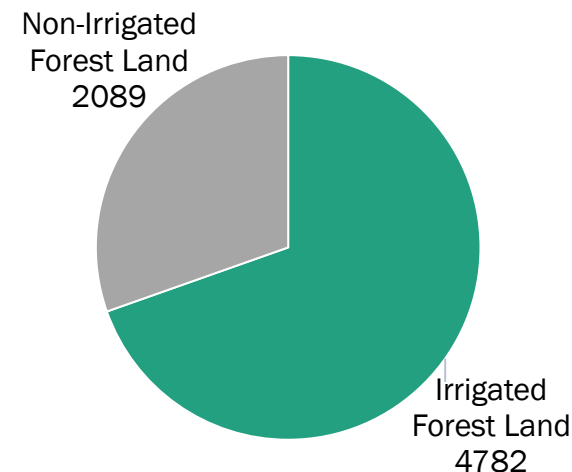
### Suggested Interventions

- Rehabilitation of non-functional tube-wells
  - Procurement of new solar plates
  - Repairs for electrical works & new panels
  - Civil work as per site requirement

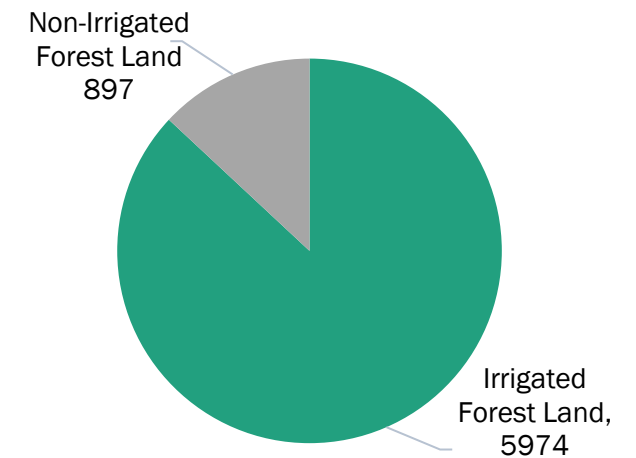


Existing Tube well in Depalpur Forest

Current Case  
(Served VS Unserved)



Future Case  
(After Rehab of TWs)



# Proposed Interventions

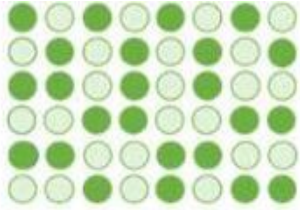
## 7. Reforestation – Afforestation

### Scope of Work:

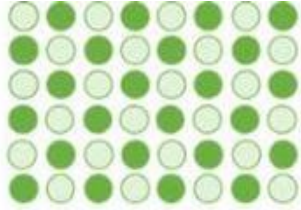
- Improvement of natural habitat for regional biodiversity
- Improved Ecosystem Services
- Climate change mitigation
- Improved human-biodiversity interaction

### Conceptual Design

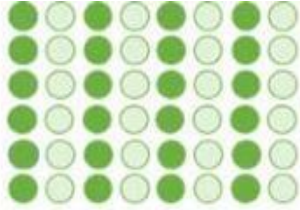
- Afforestation at Depalpur Forest – Okara (300 acres);  
Mixed Seedling plantation
- Afforestation at Chichawatni Forest – Sahiwal (400 acres);  
Mixed Seedling plantation
- Afforestation at Dall Waryam, Pakpattan (100 acres);  
Mixed Seedling plantation



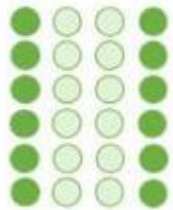
Mixed Plantation



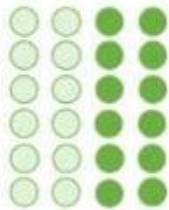
Inter-plantation



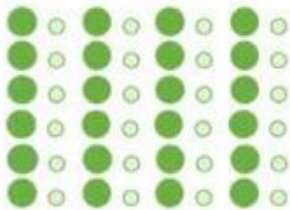
Inter Row Plantation



Row-Strip Plantation



Strip Inter-plantation



Relay Inter-plantation



*Acacia modesta*



*Dalbergia sissoo*



*Ziziphus nummularia*



*Acacia nilotica*

# Proposed Interventions

## 8. Linear Plantation - Pathway Lineage Parks

### Scope of Work:

Total Area: 132 Av. Kms

- Along Pakpattan Railway Line, Sahiwal (4.5kms)
- Along Railway Line Arifwala, Sahiwal (4kms)
- Along Railway Track Okara, Sahiwal (5kms)
- Along Railway Track Renala Khurd, Okara, Sahiwal (3kms)
- Along Canal Renala Khurd, Okara, Sahiwal (3.5kms)
- Along 9L Canal Along Kannan Park, Sahiwal (1km)
- Along Sahiwal Pakpattan Road, Pakpattan, Sahiwal (3.5kms)
- Along Delhi Multan Road, Arifwala, Pakpattan (4kms)
- Along Okara Depalpur Road, Okara (4.5kms)
- Along Kasur Road, Depalpur, Okara (4kms)
- Along Allama Iqbal Road, Chichawatni, Sahiwal (1km)
- Rao Ali Stadium Road, Chichawatni, Sahiwal (1km)
- Lahore-Multan Road, Sahiwal (6.3km)
- Arra Tulla Road, Sahiwal (2.33km)
- Noor Shah Road, Sahiwal (2.55km)



Railway line, Okara



Canal line, Pakpattan



Canal Renala Khurd,  
Okara



Railway line Renala  
Khurd, Okara

### Benefits:

- Micro Climatic Modification
- Economic Diversification
- Eco-Friendly environment
- Preventing Soil Erosion
- Carbon Sequestration
- Improved Ecosystem services
- Human-Biodiversity Interactions
- Recreational Point

# Proposed Interventions

## 8. Linear Plantation - Pathway Lineage Parks

### Scope of Work:

- Development of Lineage Park along Canal Renala Khurd, Okara, Sahiwal (40 ft wide and 3kms long track)
- Development of Lineage Park along along the Railway Track Pakpattan (55 ft Wide and 3 kms long)
- Development of Track Lineage Park in Canal Colony Pakpattan ( 60 ft wide and 1.5 km long pathway)

### Benefits:

- Community Recreation Areas
- Enhancement of Biodiversity
- Eco-Friendly environment
- Urban Green Cover Enhancement
- Carbon Sequestration
- Noise Reduction
- Air Quality Improvement
- Recreational Point



Pathway along Pakpattan  
Railway



9L Canal, Sahiwal






Pathway Canal Colony,  
Pakpattan



Pathway along Renala Khurd  
Railway

# CONCEPTUAL DESIGN FOR PLANTATION ALONG ROADS

## Legends

- Green Area 
- Pathway 
- Green Area 

## Plantation

- Acacia nilotica (Kikar) 
- Morus Alba (Shahtoot) 
- Cassia Fistula (Golden Shower) 
- Ziziphus Nummularia (Ber) 

## Site Image

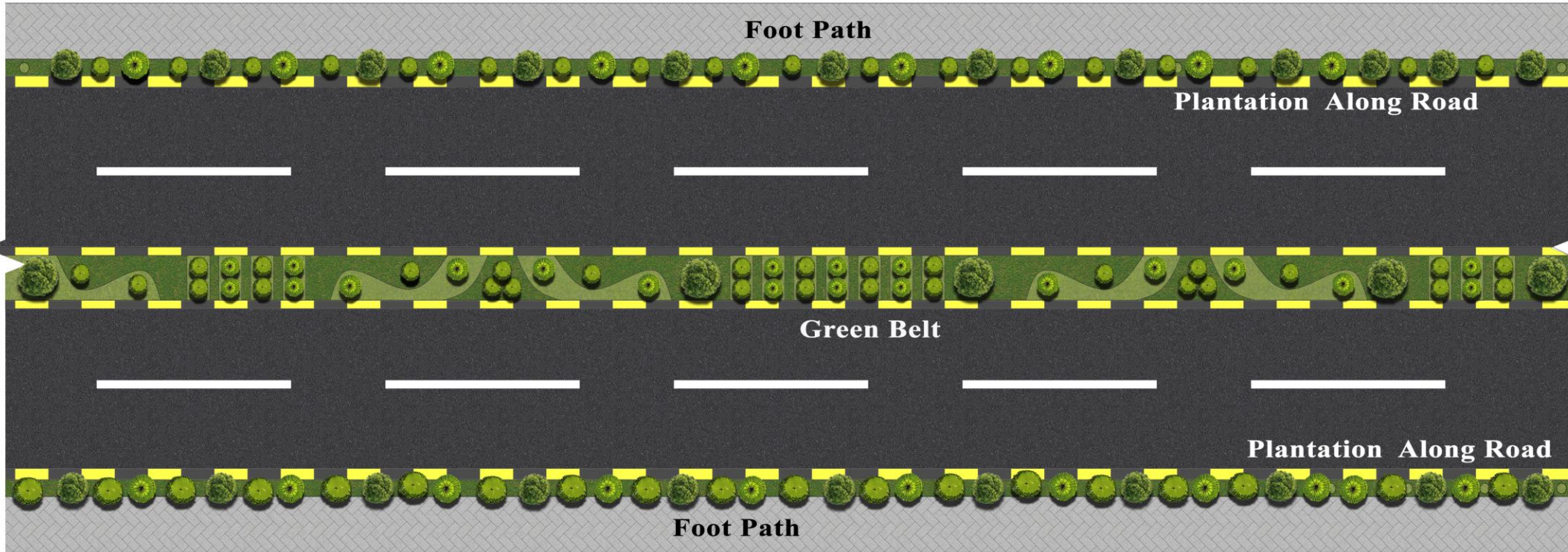


Lat: 30°17'57.38"N  
Long: 73° 4'3.56"E

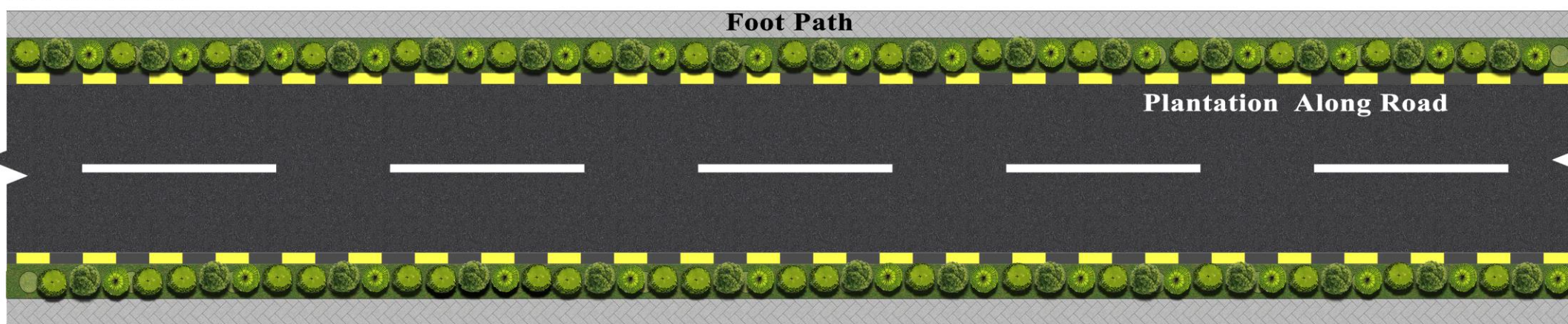


Lat: 30°38'44.97"N  
Long: 73° 6'19.05"E

### DOUBLE ROAD




### SINGLE ROAD



Total Length : 5km

# CONCEPTUAL DESIGN FOR LINEAGE PATHWAY PARKS


## Legends


Green Area 

Natural Soil 

Green Area 

## Plantation

Acacia nilotica  
(Kikar) 

Morus Alba  
(Shahtoot) 

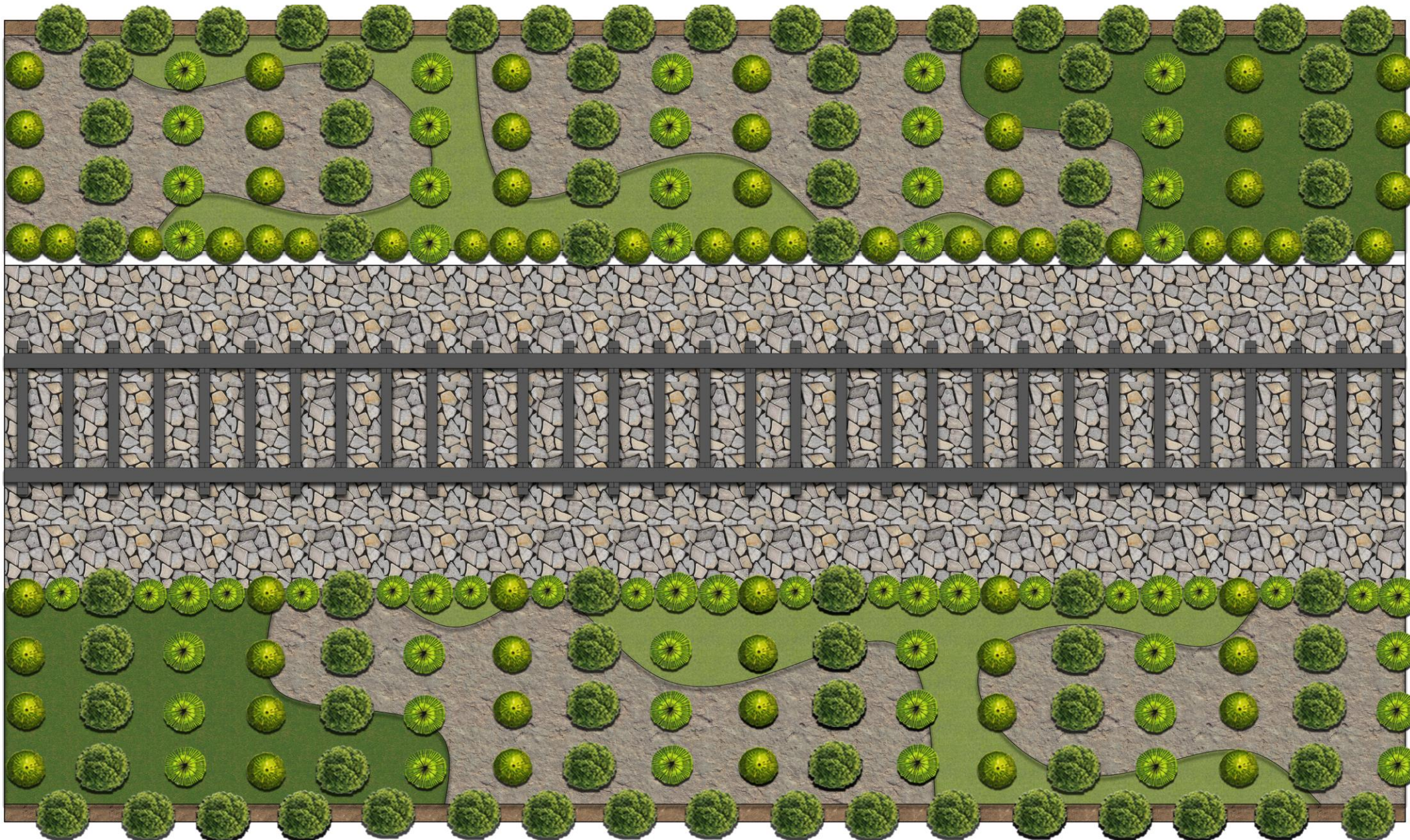
Ziziphus  
Nummularia  
(Beri) 

## Site Image



Lat: 30°20'59.53"N

Long: 73°22'40.28"E



Total Length : 5km

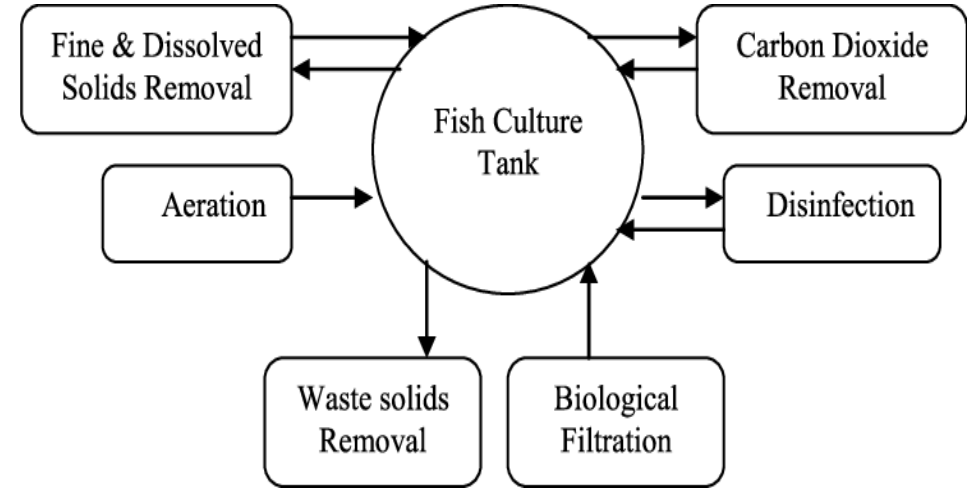
# Proposed Interventions

## 9. Zero Water Discharge RAS Aquaculture Hatchery or Construction of Sustainable Biofloc Fish Aquaculture System on Zero Liquid Discharge in Pakpattan

- Development of Sustainable Zero Water Discharge Hatchery in Pakpattan (15 Acres Land)
- Rehabilitation of Fish Hatchery Arifwala, Pakpattan (12 Acres Land)

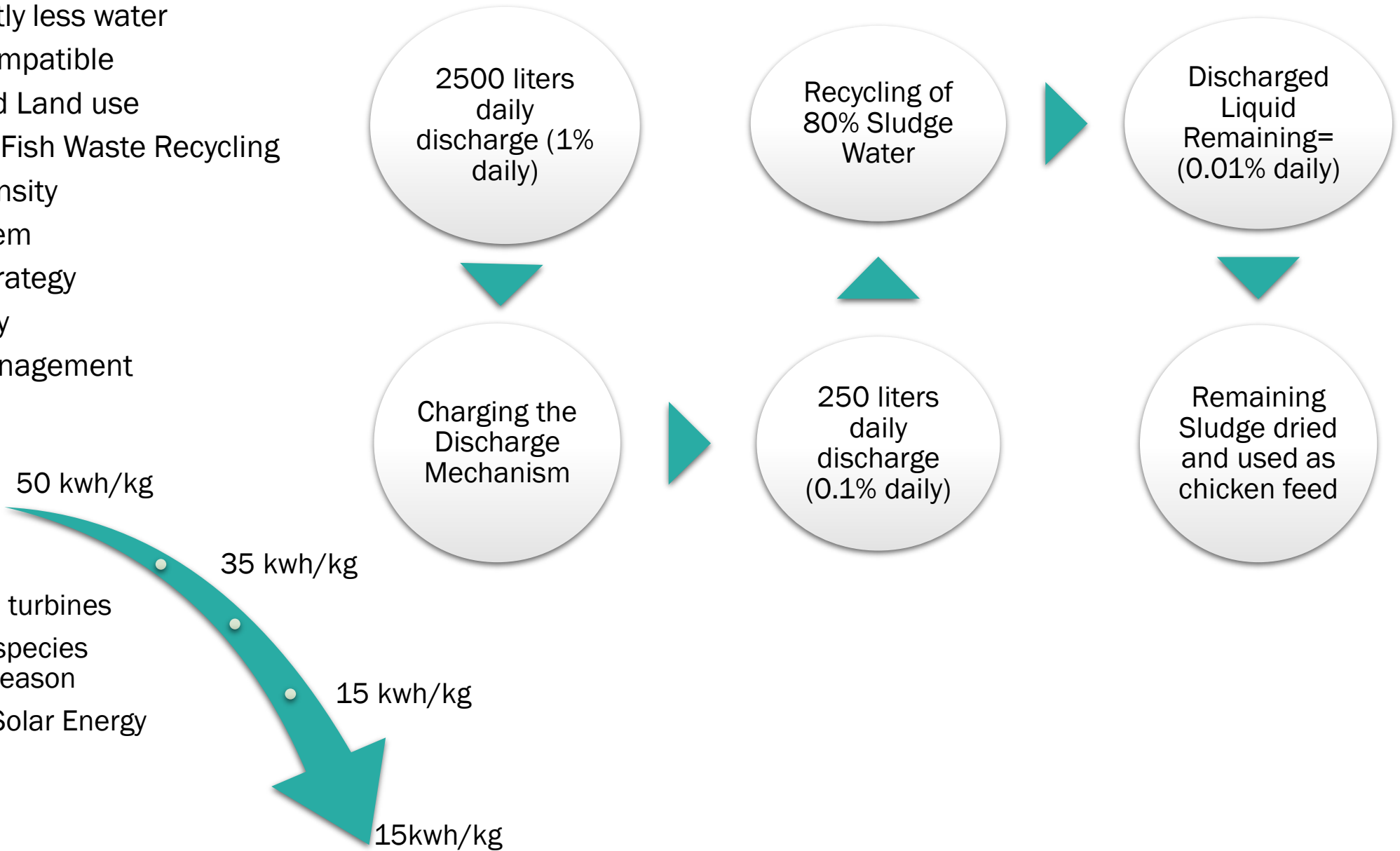
### Proposed Components for RAS Hatcher:

- Filtration screens
- Breeding pond
- UV light for the disinfection of the water
- Fish culture Pond
- Bio filter basin combined with Aeration and Membrane biofiltration
- Gravel filter to trap the sludge particles.
- Water recycling Pond to recycle the overload water
- Sludge basin to gather sludge waste.



## Advantages of RAS Aquaculture Hatchery

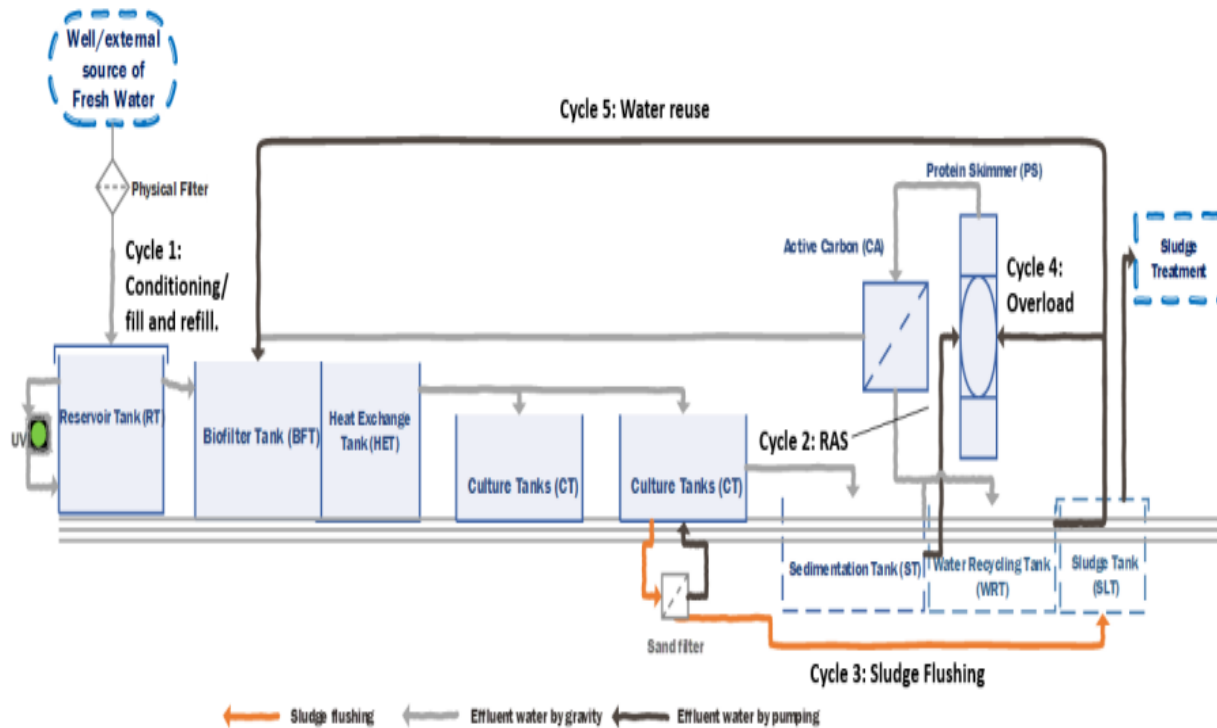
- Requires significantly less water
- Environmentally Compatible
- Efficient Energy and Land use
- Sustained efficient Fish Waste Recycling
- Higher Stocking Density
- Smart Control System
- Optimal Feeding Strategy
- Provides Biosecurity
- Improved Stock Management



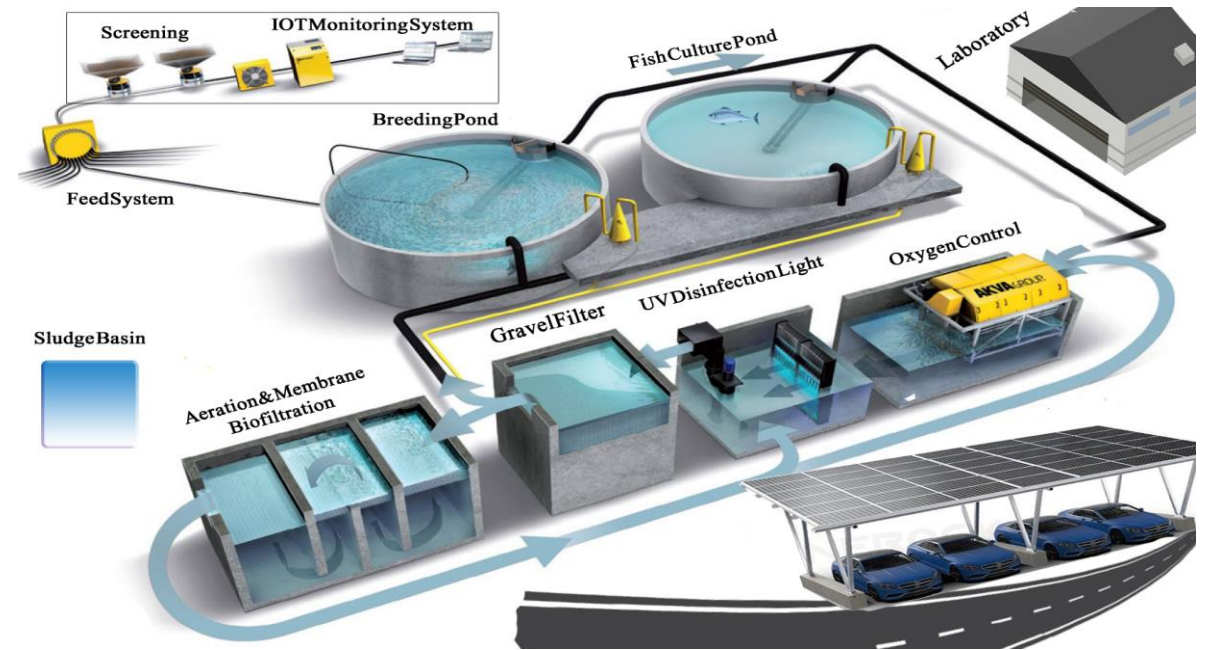
# Arial View of Site location for Sustainable Fish Aquaculture System



## Schematic overview of the hybrid ZWD-RAS system installed in Tabuk (Saudi Arabia)



## Design Layout of Proposed Sustainable Aquaculture Fish Farm



# Proposed Interventions

## 10. Forest Park Development

**Area:**

- Development of Dul Waryam Forest Park, Pakpattan (40 Acres)

**Scope of Work:**

- Provision of Recreational Facilities
- Support native wildlife populations.
- Establishment of vacant area to Botanical nursery
- Consider sustainable water management practices for maintaining the lake
- Improved human-biodiversity interaction

**Conceptual Design**

- Bird Aviary
- Botanical Garden
- Wildlife Area
- Water Lake
- Rest House
- Gazebos
- Cafeteria
- Walking Tracks
- Admin Block



Nursery



Water Lake



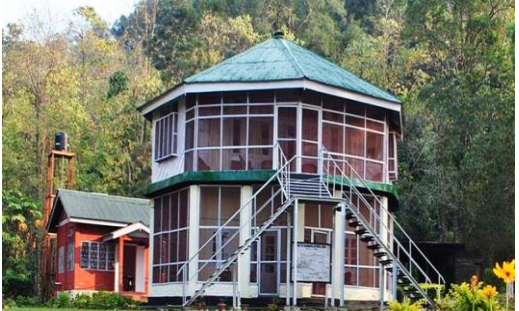
Botanical Garden



Walking Track

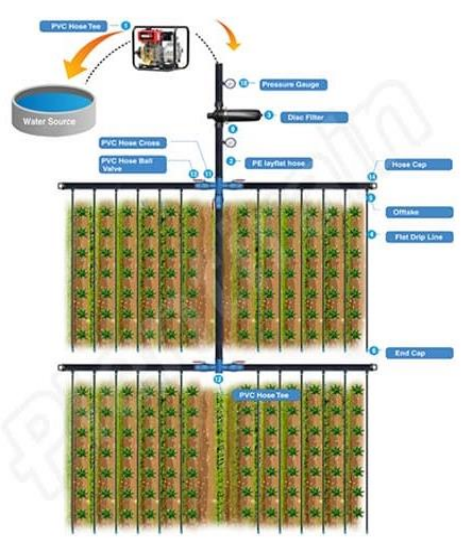


Wildlife fencing Area



Rest House

Concept Design of Forest Park



Drip Irrigation Design for Nursery

# CONCEPTUAL DESIGN FOR FOREST PARK



## Components

- A-Apartments
- B-Walking Trail
- C-Bird Cages
- D-Bee House
- E- Information Center
- F-Toilet Block
- G-Parking Area
- H-Admin Office
- I- Poly Bag Nursery
- J-Bed Nursery
- K-Potted Nursery
- L-Cafeteria
- M-Natural Soil
- N-Entrance
- O-Orchidarium
- P-Scatter Plantation
- Q- Children PlayArea
- R-Animal Cages
- S- Lake
- T-Rest House



## Legends

- Green Area
- Pathway
- Natural Soil
- Buildings
- Green Area
- Green Area

## Plantation

- Acacia nilotica (Kikar)
- Morus Alba (Shahtoot)
- Cassia Fistula (Golden Shower)
- Ziziphus Nummularia (Beri)

## Site Image



Lat: 30°27'33.28"N  
 Long: 73° 8'51.09"E

**Total Covered Area**  
**40.0 Acre**

# Proposed Interventions

## 11. Nature Based Solution - Canal Rejuvenation of Lower Bari Doab Canal Sahiwal

### Scope:

- Constructed wetlands and
- Floating bed wetlands
- Active Biodigester

### Benefits:

- Nature-based Methods of wastewater treatment also play role in sustainable urban landscaping and increase human-ecosystem interactions, along with the following benefits;
- Pollutant Absorption Capacity
- Low O&M Cost compared to conventional systems.



Existing condition of the proposed project site

### Proposed Plant Species for Constructed Wetland



*Phragmites karka*  
(Common Reed)



*Typha latifolia*  
(Cattail)



*Potamogeton perfoliatus*  
(Redhead Grass)



*Pistia stratiotes*  
(Water Lettuce)



*Nelumbo nucifera*  
(Indian Lotus)



*Lemna minor*  
(Duckweed)

# SWAB (Scientific Wetland for Active Biodegradation) Bed Concept

## SWAB Treatment System

### Dimensions of Gravel Bed

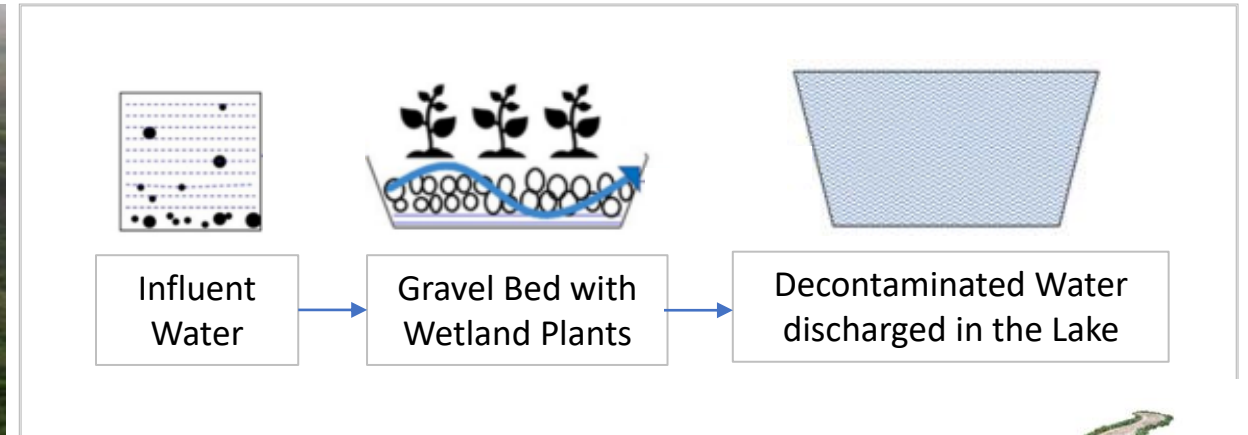
- Length: 25 m, Width: 10.11m, Depth: 2.0 to 2.6m;
- No. of chambers: 5;
- Filler stone aggregate of nominal size of 200 to 300mm over a depth of 77cm, 100mm over a depth of 38cm, 80mm over a depth of 115cm;
- Five manholes for sewage collection;
- 200mm sewage collection pipe;



## Schematic Diagram of SWAB Treatment



Floating Bed Wetland



# Proposed Interventions

## 12. Installation of Phytoplankton based Floating treatment Wetland (FTW) on wastewater Pond in Arifwala & Deepalpur

### Area:

#### Arifwala city:

- Domestic wastewater were carried through open drains into the open pond (Area: 19.3 Acre; Depth 25 ft).
- 0.4 Cs of domestic sewage discharge from adjoining catchment area of 0.4 km<sup>2</sup> into the open pond / agriculture fields causing contamination of water, food chain and several health issues.
- Pond is 25 ft deep and no safety wall/ barrier placed, caused death of a child by falling into it.

#### Arifwala city:

- Existing Disposal station went out of order so a wastewater pond has been formed at the site of almost 1.3 Acre.
- Almost 0.15 Cs of domestic sewage discharge from adjoining catchment area of 0.1 km<sup>2</sup> into the open pond / agriculture fields leading pollution and health issues.



Wastewater Pond in Arifwala



Wastewater Pond in Deepalpur



Location map of Wastewater Pond in Arifwala



Location map of Wastewater Pond in Deepalpur

# Proposed Interventions (Continue...)

## Design

- 1 m<sup>2</sup> of the non-woven medium has a BMQ of 200m<sup>2</sup> and plant roots equates to 300m<sup>2</sup> giving a BMQ of 500m<sup>2</sup> per 1m<sup>2</sup> of Floating Treatment Wetland
- Floating wetlands media can use geotextile non woven material.

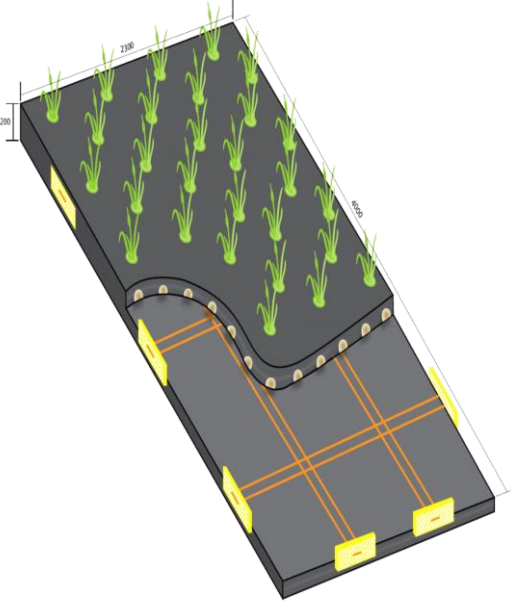
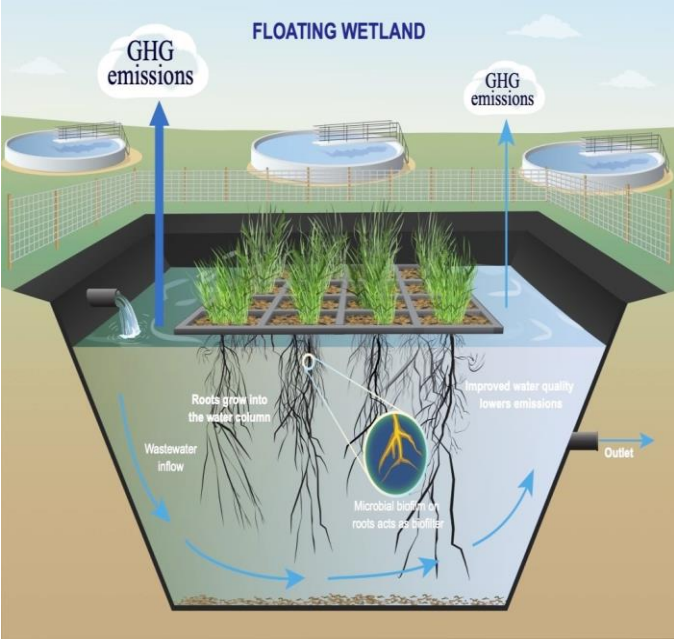
Treatment Technology	Design Parameters	Typical Values
Floating Wetland	Thickness	200 mm
	Matrix/media layers	04
	Typical size of module	150 mm
	Depth of layers	4 x 2.3 m
	Typical reserve buoyancy	40kg – 50kg per m <sup>2</sup> .

Wetland Plants	COD Removal Efficiency %	BOD Removal Efficiency %	TSS Removal Efficiency %
Water Hyacinth	95	96	84
Water lettuce	27	41	85
Typha latifolia	48	31	72

Expected Results of Floating Treatment Wetland

## Benefits:

- Groundwater recharge
- Provide habitat to support Biodiversity
- Provide Aesthetic Service
- Pollution/Contamination reduction



Module layout showing cutaway section of wetland made by foam and Nylon webbing connecting between Aluminum Joiner Plates

# Proposed Interventions

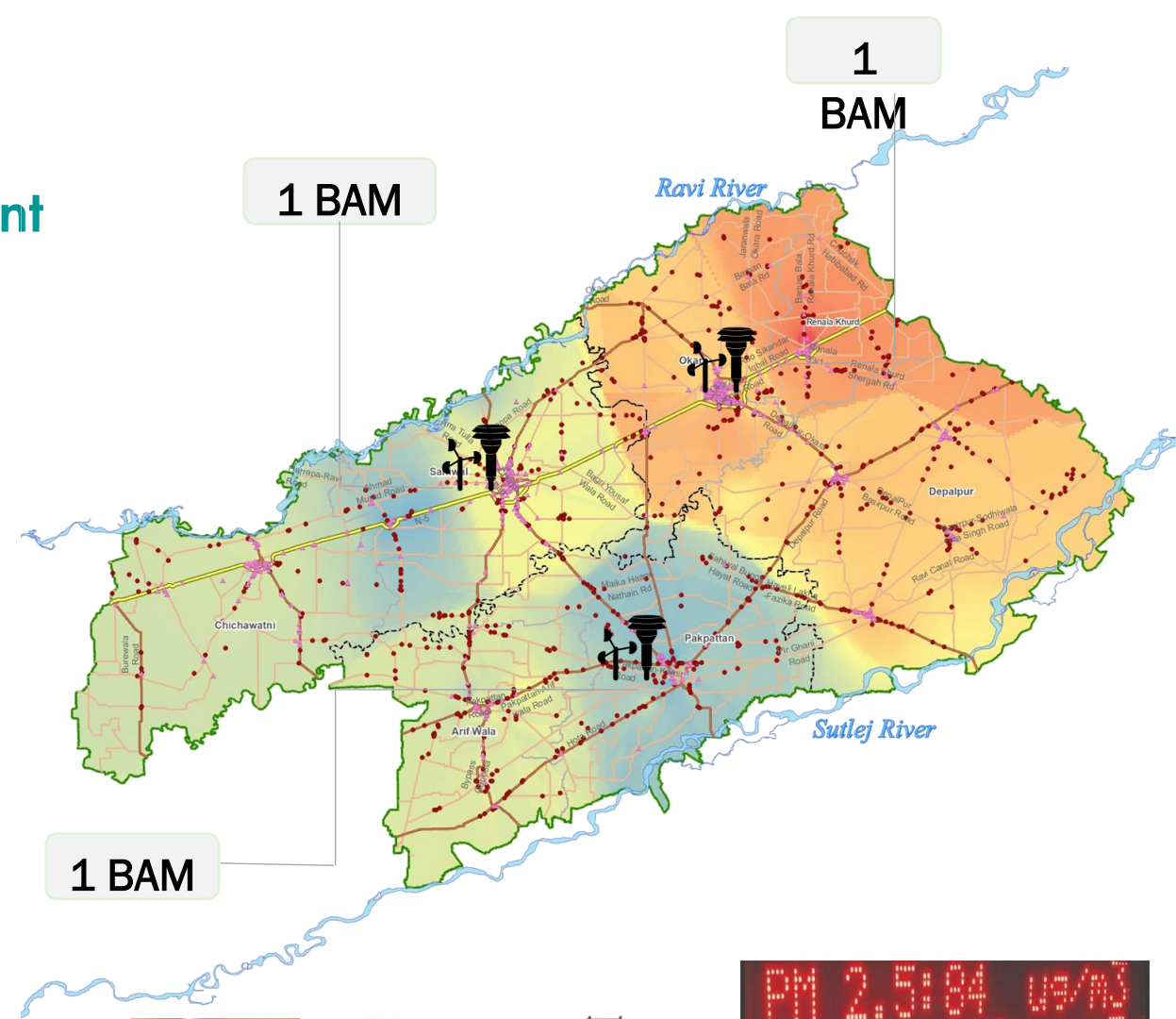
## 13. Installation of Air Quality Monitoring Equipment

### Scope of Work:

- Installation of Air Quality Monitoring Equipment's in Sahiwal district (1 BAM & 25 Low cost equip)
- Installation of Air Quality Monitoring Equipment's in Okara district (1 BAM & 25 Low cost equip)
- Installation of Air Quality Monitoring Equipment's in Pakpattan district (1 BAM & 20 Low cost equip)
- Installation of three large screens in Sahiwal city, displaying air quality indices.

### Benefits:

- Provides Real-time air quality information
- Supports informed decision-making
- Safeguard public health
- Enhance capacity and providing training to government officials and academia.



Low Cost air quality equipment



Display of Air quality indices on screen

# Proposed Projects Summary - SRDP

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Sr. No.	Projects	Estimated Cost (Million Rs.)
1.	Short – Term Projects	929
2.	Medium – Term Projects	583.8
3.	Long – Term Projects	629.2
	<b>Total</b>	<b>2142</b>

# Proposed Projects Summary - SRDP

Sr. No.	Projects	Estimated Cost (Millions Rs.)
Short – Term Projects		
1.	Afforestation	
	▪ Sahiwal (400 Acres)	165
	▪ Pakpattan (100 Acres)	41.3
2.	Linear Plantation	
	▪ Sahiwal (40 Av. Kms)	10
3.	Agro-Canopy Forest Okara (20 Av. Kms)	5
4.	Rehabilitation of Forest Irrigation Tube-wells (05 No's)	7.5
5.	Eco-Landscape along Okara Canal (3 Km Length)	34
6.	Aqua Nature Park	
	▪ Fatima Jinnah park Arifwala (8.5 Acres)	93.6
7.	Community Gardens	
	▪ Al-Abbas Park Depalpur (2 Acres)	55

# Proposed Projects Summary - SRDP

Sr. No.	Projects	Estimated Cost (Millions Rs.)
<b>Short – Term Projects</b>		
9.	Pathway Lineage Parks	
	<ul style="list-style-type: none"> <li>▪ Development of Lineage Park along Canal Renala Khurd, Okara, Sahiwal (40 ft wide and 3kms long track)</li> </ul>	34
10.	Restoration and Improvement of Parks	
	<ul style="list-style-type: none"> <li>▪ 07 Parks – Sahiwal District</li> <li>▪ 13 Parks – Okara District</li> <li>▪ 04 Parks – Pakpattan District</li> </ul>	443
11.	Installation of Air Quality Monitoring Equipment in Sahiwal district	
	<ul style="list-style-type: none"> <li>▪ (1 BAM &amp; 25 Low cost equip)</li> </ul>	24.6
	<ul style="list-style-type: none"> <li>▪ Display of big screen</li> </ul>	16
<b>Total</b>		<b>929</b>

# Proposed Projects Summary - SRDP

Sr. No.	Projects	Estimated Cost (Millions Rs.)
<b>Medium – Term Projects</b>		
1.	Afforestation	
	▪ Okara (300 Acres)	123.8
2.	Linear Plantation	
	▪ Okara (50 Av. Kms)	12.3
3.	Forest Sprouting Reserve	
	▪ Okara (4.8 Acres)	16.5
4.	Sulemanki Wildlife Park – Extension & Rehabilitation	27.0
5.	Aqua Nature Park	
	▪ Baba Farid Park Pakpattan (3.5 Acres)	43.8
6.	Canal Rejuvenation of Lower Bari Doab Canal Sahiwal	23.6
7.	Community Garden	
	▪ Quaid-e-Azam Chowk Green Belt (80 ft. long, 15 ft. wide)	1

# Proposed Projects Summary - SRDP

Sr. No.	Projects	Estimated Cost (Millions Rs.)
<b>Medium – Term Projects</b>		
8.	Forest Park Development <ul style="list-style-type: none"> <li>▪ Dul Waryam Forest Park, Pakpattan (40 acres)</li> </ul>	267
9.	Pathway Lineage Parks <ul style="list-style-type: none"> <li>▪ Development of Lineage Park along along the Railway Track Pakpattan (55 ft Wide and 3 kms long)</li> </ul>	17.8
10.	Zero Water Discharge RAS Aquaculture Hatchery <ul style="list-style-type: none"> <li>▪ Rehabilitation of Fish Hatchery Arifwala, Pakpattan (12 Acres Land)</li> <li>▪ Development of Sustainable Zero Water Discharge Hatchery in Pakpattan (15 Acres Land)</li> </ul>	26
11.	Installation of Air Quality Monitoring Equipment in Okara district (1 BAM & 25 Low cost equip)	25
<b>Total</b>		<b>583.8</b>

# Proposed Projects Summary - SRDP

Sr. No.	Projects	Estimated Cost (Millions Rs.)
<b>Long – Term Projects</b>		
1.	Linear Plantation	
	▪ Pakpattan (42 Av. Kms)	10.3
2.	Forest Sprouting Reserve	
	▪ Okara (6.7 Acres)	23.5
3.	Aqua Nature Park	
	▪ Town Park Renala Khurd (5 Acres)	62.6
4.	Development of Parks	
	▪ 05 Parks – Okara District ▪ 02 Parks – Sahiwal District ▪ 03 Parks – Pakpattan District	459.3
5.	Pathway Lineage Parks	
	▪ Development of Track Lineage Park in Canal Colony Pakpattan (60 ft wide and 1.5 km long pathway)	18.1
6.	Installation of Phytoplankton based Floating treatment Wetland (FTW) on wastewater Pond in Arifwala & Depalpur	31.4
7.	Installation of Air Quality Monitoring Equipment in Pakpattan district (1 BAM & 20 Low cost equip)	24

***Thank You***