

# one resilient semarang executive summary

## APPROACH

Like many coastal cities across Southeast Asia, Semarang faces an uncertain future. Semarang is located at the intersection of a dynamic water system from upland to lowland and a growing economic corridor along the coast, from east to west. The city will soon arrive at a tipping point in its current trajectory: extractive processes will lead to significant aquifer depletion and land instability, increasing the city's vulnerability to flooding in lowland and upland areas. Today, physical transformations across the city – densification, informality, and infrastructural expansion – are accelerating due to a whole roster of interrelated social, economic, ecological, and political conditions. However, as our research shows, these aspects can also be leveraged to build resilience.

As part of Water As Leverage, the two design teams have developed 5 strategic programs under one comprehensive approach for the future of Semarang by tackling water supply and subsidence, leveraging existing and planned large-scale developments for resilience and utilizing the abundance of water to create a vision that holistically addresses: 1. **Water Supply**, 2. **Subsidence**, 3. **Flooding**, and 4. **Sea Level Rise**.

## PRINCIPLES

### 1. STABILIZE BEFORE OPERATING

#### **Water supply is a precondition for adaptation**

In order to meaningfully plan and adapt to the upcoming economic shifts and the climatic changes, it is critical to focus on stabilizing current vulnerabilities by addressing the root cause of subsidence: inadequate water supply.

### 2. LEVERAGE THE BIG MOVES

#### **Resilience value to urbanization and large scale infrastructure projects**

For a meaningful impact in the city's adaption, we must leverage big capital moves that are already planned, increase their resilience value, and help shift the current approach from single-purpose infrastructure investments to multi-purpose and multi-layered interventions.

### 3. DIVERSE BUT NOT FRAGMENTED

#### **Unified vision for a coastal region**

In order to effectively address climate-related challenges, a unified and holistic approach in the coastal zone is needed, where industry, nature and communities are harmonized into one unified coastal ecosystem.



## 5 STRATEGIC PROGRAMS

From upland to the coast, the design teams have developed proposals for 5 key strategic programs for Semarang.

- 1A** Water-Neutral Industry (demand side)
- 1B** Feeding the Industry (supply side)
- 2** Network of Resilient Kampung
- 3** Integrated Protective Coastal Zone
- 4** Spongy Mountain Terrace
- 5** Rechanneling the City

ONE Resilient Team has developed the following:

### 1A WATER-NEUTRAL INDUSTRY

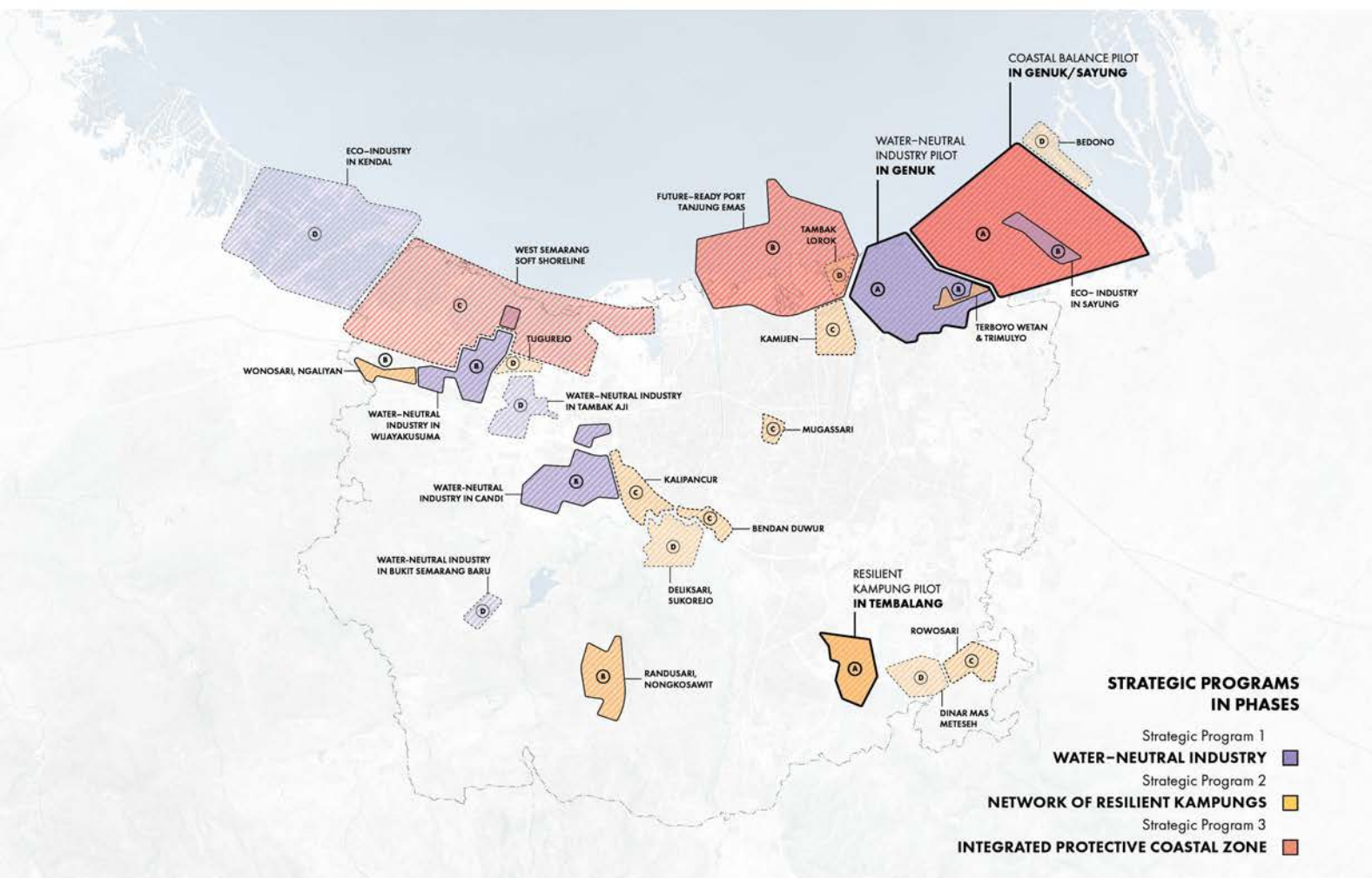
Program to promote high added-value and sustainable industrial development through the revitalization of existing industrial clusters and surrounding urban areas, incorporating water-neutral strategies, and innovative technologies and services. This program acts as a necessary step towards halting groundwater extraction and reducing land subsidence while simultaneously promoting sustainable and circular economic growth by creating incentives to optimize land use, water supply and management systems based on rain water harvesting, storage, conveyance, reuse, and recycling.

### 2 NETWORK OF RESILIENT KAMPUNGS

Program that incentivizes decentralized investments in green infrastructure for water, waste, and energy in the kampungs. The program proposes a new set of tools at the kampung level around resilient infrastructure through a Resilient Kampung Guide, especially targeted at community leaders, advocates, and facilitators. The program will leverage existing community action planning and participatory budgeting process with integrated resilience and risk mitigation planning. It enables ecological citizenship, participatory water planning, stewardship of shared resources, data collection, and - most importantly - accelerate infrastructure improvements for the city.

### 3 INTEGRATED PROTECTIVE COASTAL ZONE

Program to create an integrated vision and plan for a protective and productive coastal zone across Semarang, Kendal and Demak through metropolitan planning processes, including the development of an ecological value transfer mechanisms to allow cost and profit sharing. The program aims to ensure coastal protection through a combination of hard infrastructure with soft (mangrove) foreshores, thus enhancing long term industrial competitiveness, urban and rural development and biodiversity. Three projects are proposed that achieve this by adding value and resilience to existing and planned initiatives.



## 3+1 PROJECTS TO START

### WATER-NEUTRAL INDUSTRY PILOT IN GENUK

With the planned toll road / seawall from Semarang to Demak, there is an opportunity to leverage safe grounds behind the toll road schemes to create high capacity water-neutral industrial clusters, establishing mechanisms for value capture and organizational upgrades. Project components include redevelopment and retrofitting of industrial clusters (Kawasan Industri Terboyo – KIT and Lapangan Industri Kaligawe – LIK), integration with water harvesting and retention areas, and integration with wastewater treatment, reuse, water supply and distribution.

### RESILIENT KAMPUNG PILOTS

Interventions in kampungs with urgent issues such as **Tembalang**, to improve the stormwater management and provide an alternative sources for water supply. Components include a floodable park for larger water management capacity, green infrastructure measures, as well as a waste-to-energy low-tech facility to support the energy supply. Additional interventions in other kampung types as demonstration key focus areas, such as **Terboyo & Trimulyo**, **Wonosari** and **Nongkosawit**.

### COASTAL BALANCE PILOT IN GENUK/SAYUNG

Project that combines gray infrastructure with ecological preservation through the modification of the current toll road scheme to accommodate for coastal restoration and the creation of sediment capture areas and eco-tourism. Project components include areas for concentrated industry in Demak, ecological restoration, and river diversions in shallow areas for sediment capture. The project focuses on the cross-boundary collaboration between regencies and employs the proposed ecological transfer mechanism for profit and cost sharing for industrial growth and ecological restoration efforts.

### FUTURE-READY PORT IN TANJUNG EMAS

Proposal for resilient additions to the current Tanjung Emas Port masterplan to combine ecological restoration along with coastal protection. Components of the project include expansion of the port operations on reclaimed areas as per the masterplan with the addition of more efficient logistical areas, updated design for breakwaters with sediment capture areas, facilities modernization, drainage strategies, and greenbelt restoration. A series of flood protection strategies include shelter formations in the waters, raised platforms, and on-shore dune systems.

## CLIMATE RATIONALE

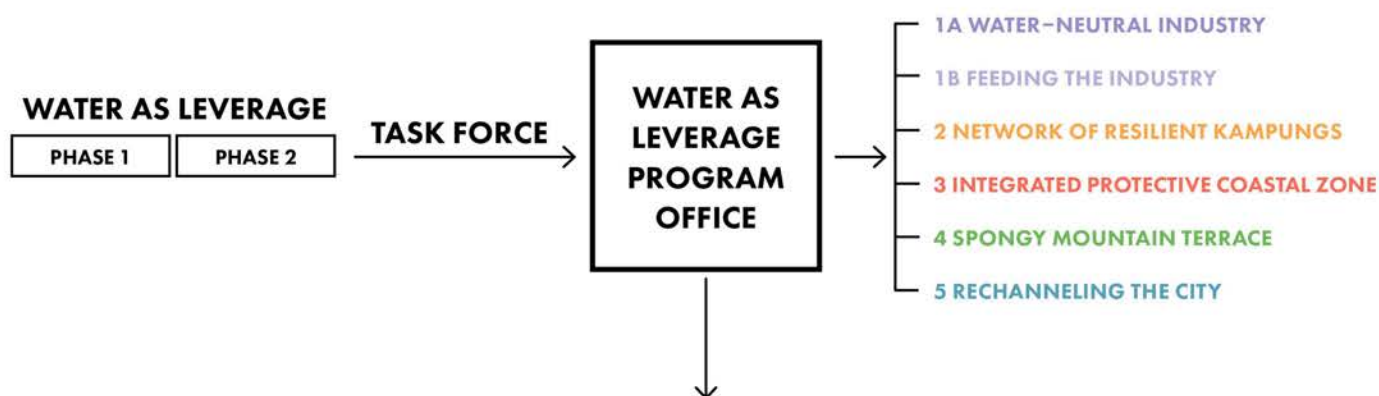
Climate change results in the following hazards in Semarang: weather variability is expected to increase, and phenomena such as El Niño and La Niña are expected to increase from their current 3 to 7 years interval to every 2 to 3 years. It is well understood that these phenomena have direct impacts on rainfall variation in Indonesia while also influencing sea-level and ocean weather by inducing more extreme waves (in extreme cases between 2 and 5 meters high). Sea level is expected to rise between around 65 cm by the end of the century should current emission patterns continue. Changing weather patterns may also cause increased periods of drought.

These conditions multiply the number of related risks such as coastal flood risk and pluvial / fluvial flood risk. These increased flood risks impact much of the vulnerable low-lying areas in the North, and can result in coastal erosion, the disappearance of wetlands and mangroves, as well as reduced viability of industrial and residential areas along the coast, where utilities and infrastructure will be impacted and daily life and business will be interrupted with increased frequency. Pluvial flood risks will have similar impacts in much of the city, with the additional risk of landslides in the hills and, with it, the decreased stability of landfills and reservoirs. In a tropical city such as Semarang, inadequate drainage and waste collection result in the added risk that flooding may cause additional pollution, increasing the likelihood of spreading water-borne disease. As the IPCC points out in its 2018 Special Report on 1.5C, heat-related morbidity and mortality are particularly high-concern health outcomes of global warming at 1.5C above pre-industrial levels, with projected urban heat islands and heat waves resulting in negative impacts to health, infrastructure, soil aridity / agriculture, coastal environments, and economic production. Socio-economic and population growth will result in higher water demand while more erratic rainfall patterns lead to longer periods of drought and water scarcity. This will increase dependency on groundwater and result in increased aquifer depletion, which, in turn, will increase land subsidence and feed back into increased coastal erosion, wetland loss, and flooding. In several parts of North Semarang, land subsidence rates are still increasing; some parts have already reached levels of more than 13 cm per year. In the long term, the combination of socio-economic / population growth and the effects of climate change can make the city increasingly unviable to maintain at its current location, resulting in a multitude of stranded assets.

The ONE Resilient Semarang team proposes a number of measures to adapt to these climate risks, that will have the

following benefits: Re-thinking the water system and improving water management practices will make Semarang's water supply more dependable, reducing city-wide dependence on groundwater extraction. Reduced extraction and replenishment upstream will reduce land subsidence which will, in turn, reduce both coastal and terrestrial flooding. More importantly, reduced land subsidence will greatly decrease future adaptation costs. Reduced flooding will also reduce flood-related health and environmental risks, especially combined with programs that will reduce the production of waste per se. The proposed green infrastructure solutions will further help with the adaptation to extreme heat and reduce loss of biodiversity in the city, while along the coast hard infrastructure combined with soft mangrove foreshores will help buffer wave impact, flood extent and adding benefits for ecotourism, and fisheries.

The ONE Resilient Semarang team proposes a number of measures to mitigate climate risks, with the following climate mitigation impacts: Reduced land subsidence will result in a slower increase of flood risks and adaptation measures to protect low-lying areas. The increase of the amount of low-lying land and polders will slow down. The main effect of this will be reduced pumping, with less (diesel) energy required. A secondary effect will be a reduced need for adaptation measures, which in themselves will have embedded energy. With reduced subsidence rates by mid-century a portion of the 6000 Ha of urban areas that are currently at risk, will remain out of the flood zone, and the energy use from the pumping of water will be reduced compared to a no-action scenario. The reorganization of the port area and industrial lands will result in more efficient logistics and reduced transportation costs, including water conveyance. The ability to maintain residential areas in proximity to the workplaces will contribute to lower costs. These will further reduce energy use. Decentralized and renewable energy sources in the industrial areas and in the kampungs will further reduce carbon emissions, while contributing to energy security. Green infrastructure, including the wetlands and the breakwaters, has an ability to capture and sequester carbon. With additional green infrastructure, these effects are considerable. In a long-term, zero-action scenario, there is considerable risk that the coastal zone of Semarang will need to be evacuated. Retreat and re-establishment of these functions elsewhere will result in significant amounts of newly embedded carbon in new construction. The re-location of 6000 Ha of city and more than 25,000 of buildings will result to more than 28 trillion rupiah (1.9 billion USD).



**1 MILLION USD ANNUAL BUDGET TO STRUCTURE AN ANTICIPATED MULTI-BILLION USD REGIONAL CAPITAL IMPROVEMENT PORTFOLIO OVER A 10 YEAR PERIOD.**

## NEXT STEPS PROGRAM OFFICE ONE RESILIENT SEMARANG

As the Water as Leverage program comes to a close, the two teams have proposed a number of compelling programs in close collaboration with the City of Semarang. Arguably, the integrated and comprehensive approach of the programs has provided the city with a new vision and direction of investment in resilience and management of growth.

The implementation of the proposed regional programs requires a long term partnership – technical, institutional and financial. A program office that can continue the approaches and methodologies developed collectively by the two consortia and Water as Leverage team will be critical to structure successful programs and projects, especially in the implementation phases. These approaches embodied in strong collaborative spirit, thoughtful engagement, interdisciplinary research/analysis, experience in structuring complex projects and public advocacy. More importantly, this program office has the potential to uncover future opportunities as well as fulfill current gaps in the effort towards investing in climate change resilience. In Indonesia, and perhaps also in other countries, there is a need to bridge the needs of a local region (comprehensive vision, integrated planning, infrastructure gaps, etc.) and the current capacity of the national government to develop and finance projects.

An entity much like the various components of the Water as Leverage program i.e. interdisciplinary team, knowledge partnership, access to international advisory, etc. can function as this bridge that links complex needs to the complex ecosystem of resources at large.

The role of the program office will consist of the following:

- To continue and contribute to the implementation of the programs that has been proposed
- To coordinate between programs and projects towards an integrated vision, direct them towards multiple benefits and contribute to the larger strategies. Programs and projects include proposed and existing efforts initiated by local government, private sector, and other international initiatives
- To monitor ongoing efforts and provide advisory role – technical, institutional and financial – with feedback and lessons learned from national and international experience
- To advocate and manage relationships amongst stakeholders, communicate and coordinate amongst disparate regional programs and projects related to water, urban resilience and climate change

## INSTITUTIONAL SET UP

Semarang City and other government entities have the authority to translate the program office's recommendations into requirements. In the first 5 years, the program office will likely need to be grant funded, both through the pre-feasibility studies it performs, as well as through an independent allowance for overall tasks such as data gathering, metrics development, independent studies and outreach.

### OFFICE RESPONSIBILITIES: BUDGET

Oversee and coordinate data collection/metrics to link and monitor various programs	100K USD / per year
Overall community engagement, advocacy, and stakeholder relation management according to the vision / narrative	200K USD / per year
Targeted studies (identify gaps between projects)	100K USD / per year
Project Level Technical Review and coordination of studies	200K USD / per year
Advisory Role (international & local)	150K USD / per year
Overhead	150K USD / per year
<b>TOTAL</b>	<b>1M USD / per year</b>

## WATER-NEUTRAL INDUSTRY PILOT PROJECT IN GENUK

PROJECT COMPONENTS	SUB COMPONENTS	ESTIMATED VALUE OF INVESTMENT	OWNERSHIP	FUNDING SOURCE	FINANCIAL/COST RECOVERY SCHEME	ECONOMIC BENEFIT
Land Development and Revitalization	Management reacquisition of industrial clusters	TBD	Private	Private. LG contribute to the development of basic infrastructures	Land sales	Increased land value
	Land consolidation/ reparcelization (assuming 100 Ha)	150 million USD	Province/ Private	APBD/Private finance	Land sales	Reacquire asset and institutional development for land-based instruments, increased land value
	Public amenities and parks	20 million USD	Municipal (Semarang)	APBD (Semarang)	n/a, unless private park. Visitors pays	Public welfare, improved attractiveness of assets, increased land value, indirect economic benefits from visits
	Reclamation (17 Ha)	100 million USD	Province/ Municipal	APBD (Province)/PPP (Concession)	Public: additional tax revenue from developable land; private land sales/ redevelopment	
Civil Improvements	Reconstructed roadways and drainage improvement (within clusters)	100 million USD	Province/ Municipal/ Private	APBD (Province)/PPP/ Private	n/a	Improved safety and attractiveness of assets, increased land value
	Levee structure along east bank of river (3km)	6.5 million USD	National (BBWS)	APBN (via PUSDA)	n/a	Reduced flood risks, improved safety and attractiveness of assets
	Elevated roadway (2km to complete polder)	4 million USD	Province	APBD (via PUSDA/ Bina Marga)	n/a	Reduced flood risks, improved safety and attractiveness of assets
	Reconstructed roadways and drainage improvement (outside clusters i.e. 5km arterial road @3.6million USD/km)	18 million USD	Province/ Municipal	APBD	n/a	Reduced flood risk, improved accessibility, value of time savings, vehicle operation cost savings
Circular Water Flows	Waste Water Treatment Plant	5 million USD	Province SOE/ Private	Private Contributions	Tariffs	Reduce sickness rate due to water; savings on health expenditures
	Water Treatment Plant	5 million USD	Province SOE/ Private	Private Contributions	Tariffs	Reduce sickness rate due to water; savings on health expenditures
	Retention Pond (250Ha) and pumping facility	100 million USD (benchmark Muktiharjo retention pond @ 400,000 USD/Ha)	National (BBWS)	APBN/PPP	Availability payment for pumping station. raw water sales to WTP	Retention pond can be a PPP venture sharing costs of construction and revenue from water supply
	Localized stormwater detention/ green infrastructure	2 million USD	Province/ Municipal	APBD (via Tata Air)	n/a	Reduced flood risks, improved safety and attractiveness of assets
Circular Waste Flows	Distribution & Collection (piping)	15 million USD	Province/ Municipal	APBD (PDAM)	Tariffs and cluster fees	
	Additional Pumping facilities (as needed)	TBD	Province/ Municipal	APBD (via Tata Air)	Availability payment for pumping station	
	Central waste collection & processing facility	5 million USD	Province SOE/ Private	APBD/PPP	Tariffs and cluster fees	
	Material stream audit of constituent companies		Private		B2B/ or grants	
<b>TOTAL</b>		<b>~600 million USD</b>				

## NETWORK OF RESILIENT KAMPUNGS PROGRAM

PROJECT COMPONENTS	SUB COMPONENTS	ESTIMATED VALUE OF INVESTMENT	OWNERSHIP	FUNDING SOURCE	FINANCIAL/COST RECOVERY SCHEME	ECONOMIC BENEFIT
Technical Assistance (3 years)	Development of kampung guideline and training modules	100,000 USD	Municipality	Donor	n/a	Institutional capacity building for long term community based planning
	Capacity building: Training, ToT, facilitators, government institutional building	300,000 USD	Municipality	Donor	n/a	Institutional capacity building and participatory process to ensure more targeted investments and successful implementation
Physical Settlement Improvements	In situ upgrade of 20 kampungs	5 million USD	PU Cipta Karya	APBN/APBD	n/a	Public welfare and comprehensive flood risk reduction
	Area development based upgrading of 1 priority neighborhood (kelurahans)	20 million USD	Municipality	APBN/APBD	n/a	Public welfare and comprehensive flood risk reduction. Area development strategies and land consolidation can be leveraged to restructure public assets
	Reconstructed roadways and drainage improvement (within clusters)	100 million USD	Province/ Municipal/ Private	APBD (Province)/PPP/ Private	n/a	Improved safety and attractiveness of assets, increased land value
Institutional/ Administration of resource relocation	Development and administration of special city budget for resilient kampung	1 million USD	Municipality	APBD	n/a	
<b>TOTAL</b>		<b>~30 million USD</b>				

## COASTAL BALANCE PILOT PROJECT IN GENUK / SAYUNG

PROJECT COMPONENTS	SUB COMPONENTS	ESTIMATED VALUE OF INVESTMENT	OWNERSHIP	FUNDING SOURCE	FINANCIAL/COST RECOVERY SCHEME	ECONOMIC BENEFIT
Land Development	Reorganization of land and reparcelization	TBD	Provincial/Municipality	APBD	Land sales	Increase land value
	Reclamation	TBD	Provincial/Municipality	Private finance/PPP	Land sales	Increase income tax from saleable land. Currently in Demak, it is not recommended to reclaim land. Cost of reclamation 8 million IDR/sqm > 1 million IDR (land value)
	Land acquisition/consolidation	TBD	Provincial/Municipality	APBD/Private finance/PPP	Land sales	Reacquire asset and institutional development for land-based instruments, increased land value
	Integration of public amenities and parks	TBD	Provincial/Private	APBD/Private finance	Land sales	Public welfare, improved attractiveness of assets, increased land value, indirect economic benefits from visits
	Construction of polder system and sea dyke modification	TBD	Provincial	APBN/APBD	Land sales	Protection of assets
	Construction of mangrove park	20 million USD	Provincial/Private	APBD/Private finance	Ecological transfer	Long term protection of coastal zone and land behind the greenbelt
	Integration of public amenities and parks	10 million USD	Provincial/Private	APBD/Private finance	Tourism	Public welfare, indirect benefits from tourism and public activities
<b>TOTAL</b>		<b>TBD</b>				

## FUTURE-READY PORT TANJUNG EMAS

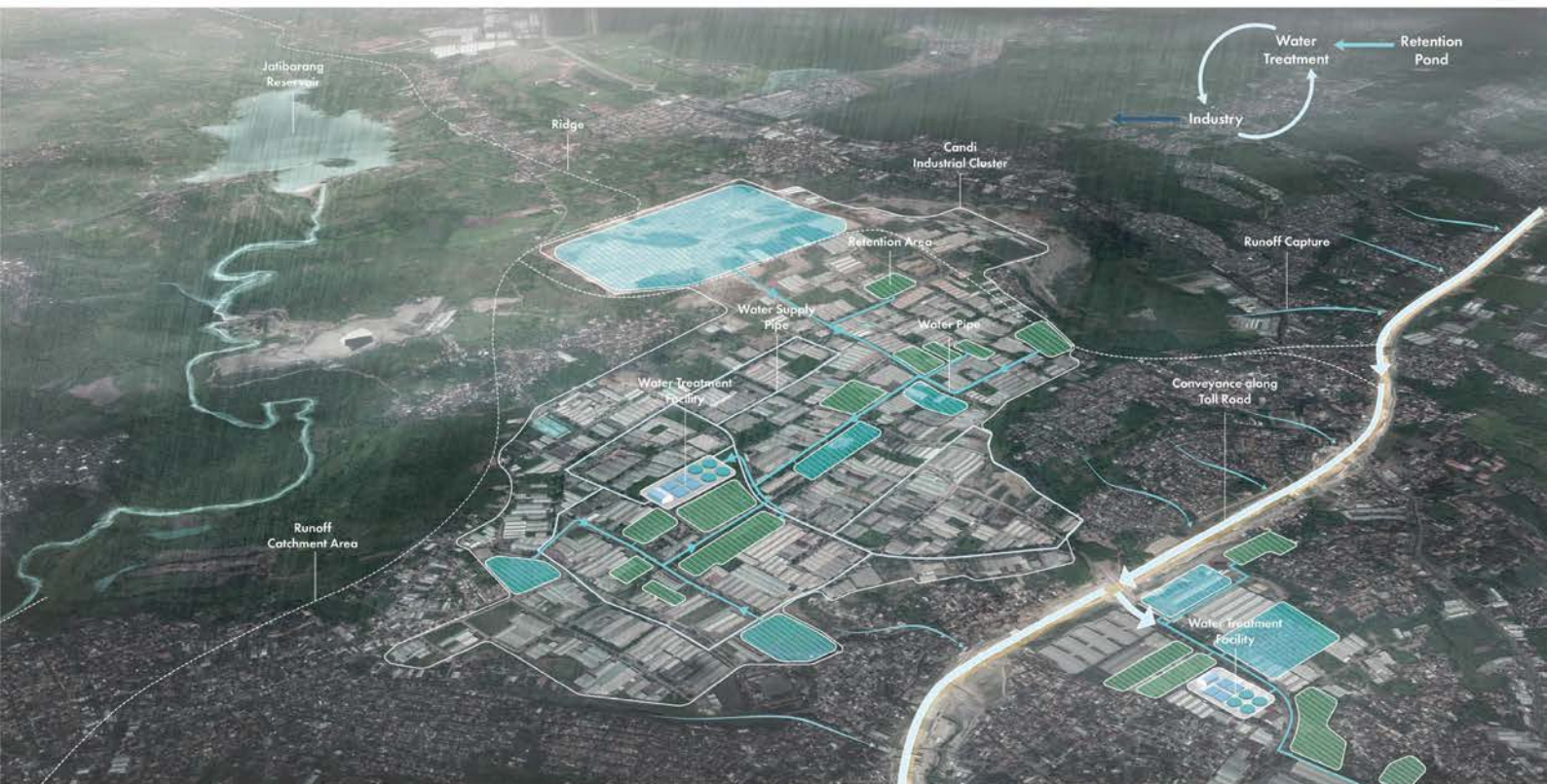
PROJECT COMPONENTS	SUB COMPONENTS	ESTIMATED VALUE OF INVESTMENT	OWNERSHIP	FUNDING SOURCE	FINANCIAL/COST RECOVERY SCHEME	ECONOMIC BENEFIT
Integrated harbor protective system	Dredging and sediment transport/relocation	TBD	Provincial	APBN/APBD	n/a	Longer term protection, reduction in maintenance cost of protective infrastructure
	Ecological planting and management	TBD	Provincial	APBD/Donor	n/a	Longer term protection, reduction in maintenance cost of protective infrastructure
	Breakwater design modification	TBD	Provincial	APBN/APBD	n/a	Longer term protection, reduction in maintenance cost of protective infrastructure
Port expansion	Reclamation and site development	TBD	SOE/Private	SOE/Private contribution	Tariffs	Increased capacity for industrial logistics and trade
	Operational facilities	TBD	SOE/Private	SOE/Private contribution	Tariffs	
	Land acquisition	TBD	SOE/Private	SOE/Private contribution	Concession fee	
<b>TOTAL</b>		<b>TBD</b>				

# water—neutral industry

PROGRAM PROPOSAL  
APRIL 2019

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## PROGRAM DESCRIPTION

Program to promote high added-value sustainable industrial development through revitalization of existing industrial clusters and surrounding urban areas, water-neutral strategies and innovative technologies and services. This program acts as a necessary step towards stopping groundwater extraction and reducing land subsidence while simultaneously promoting sustainable and circular economic growth by creating incentives to optimize water supply and management systems based on rain water harvesting, storage, conveyance, reuse, and recycling.

## RATIONALE

Water access, security, and demand management are key to stop groundwater extraction and, in the process, land subsidence. Despite being the major contributor to groundwater extraction, industries will only grow in the coming years. Improved and alternative water supply to the sector is urgent but due to water scarcity, supply should go hand in hand with water demand management. The construction of dams, along with extensive distribution, often comes with immense environmental, political, and monetary costs. One of the near to medium-term solutions is to optimize the water supply and demand through cluster-scale water storage and treatment infrastructure. However, this requires existing industrial clusters to upgrade or modernize their management structures, as well as raise capital to revitalize existing infrastructure. There is a need to synchronize investments for industrial development and improved logistics with integrated and sustainable water infrastructure.

## KEY OBJECTIVES

### WATER

- 1 Reduce flooding (surface) and future associated costs
- 2 Reduce subsidence rate in Semarang and adjacent areas
- 3 Stop groundwater extraction for industrial uses
- 4 Recharge aquifer in upland areas
- 5 Provide alternative sources for water supply

### ENVIRONMENTAL

- 6 Reduce environmental pollution and water contamination
- 7 Reduce energy costs from pumping

### SOCIAL

- 8 Create incentives to reduce, recycle, reuse wastewater
- 9 Raise awareness regarding long term effects of extraction
- 10 Job security and better working environment for workers

### ECONOMIC

- 11 Create job opportunities based on new regional economies
- 12 Reduce utility costs for industries

### GOVERNANCE

- 13 Promote sustainable industrial development and management
- 14 Promote innovative land based tools for resilience planning
- 15 Promote the establishment of industrial water supply companies

# water—neutral industry

## PROGRAM PROPOSAL

	SHORT TERM	MEDIUM TERM	LONG TERM
PROJECTS	<p><b>[01] WATER—NEUTRAL INDUSTRY PILOT IN GENUK</b>  Redevelopment and retrofitting of Genuk area behind toll-road and dike, Kawasan Industri Terboyo (KIT) and Lapangan Industri Kaligawe (LIK), integrated with water harvesting, retention, and with wastewater treatment, reuse, and water supply to industries and urban areas.</p> <p><b>[02] NORTH EAST LOGISTICAL CORRIDOR REVITALIZATION</b>  Comprehensive infrastructure upgrade and water management of North Coastal Road (Jl Pantura) as a logistics corridor.</p>	<p><b>[03] SAYUNG ECO-INDUSTRIAL ZONE</b>  New industrial area integrating ecological restoration with sustainable water practices.</p> <p><b>[04] WATER—NEUTRAL INDUSTRIES EXPANSION IN WEST SEMARANG</b>  Expanding on the methodologies developed in Northeast Semarang (regulations, land and tax based instruments, public-private partnerships), the revitalization process can be replicated in other clusters in the West, namely <b>Candi</b> and <b>Gatot Subroto</b>. Best practices can become regulatory guidelines for new industrial cluster north of <b>Wijayakusuma</b>.</p>	<p><b>[05] PROVINCE AND NATIONAL LEVEL REPLICATION</b>  The process of creating sustainable water management in industrial clusters and stopping groundwater extractions can be replicated in other existing or new industrial clusters across the province of Central Java and the country where there is excessive use of groundwater and shortage of water supply.</p>
ENABLING ENVIRONMENT	<p><b>Institutional / Legal Framework</b></p> <p><b>Regulations to incentivize investment:</b> Complete enforcement of moratorium with grace period - leveeing heavy groundwater tax or penalty for non-compliance that makes investing in sustainable water systems become viable.</p> <p><b>Leverage tax incentives to promote investment:</b> Provide tax breaks to high added value industries with criteria of employment, sustainable water systems, skills training etc. such that it becomes viable for new industries to replace older ones.</p> <p><b>Land instruments to accelerate revitalization:</b> Government promises to upgrade existing infrastructure if tenants decide to go through land readjustment/land value capture process. Third party investor can be incentivized to participate in revitalization effort.</p> <p><b>Governance</b></p> <p><b>Cooperation between industrial operators in targeted clusters:</b> Organized through raising awareness and engagement on long term issues at hand. Government could stimulate investments in industrial water demand by promoting PPP's research and development and tax amnesty or grace periods. Groundwater taxing and promoting investments should go hand in hand.</p> <p><b>Provide cost efficient and reliable alternatives to current water supply and treatment technologies:</b> Alternatives combined with awareness raising to industries will motivate stakeholders to stop groundwater extraction.</p>		
EXPECTED OUTCOMES	In the short term, leveraging the toll road construction will help bundle revitalization programs along with the potential land value capture mechanisms. NE Semarang will be a demonstrative project with higher added value tenants in the industrial clusters along with better water infrastructure and cost efficient technologies. Regulatory framework to create the enabling environment is already in place.	In the medium term, the methodology can be replicated in West Semarang. Over time, industrial clusters will adjust to the new regulations by investing in water infrastructure, choosing water-neutral tenants, and adopting better management structures. Targeting inner city industrial clusters to become fully water neutral.	In the long term, with established regulations and secured capital, industries will become high efficiency and will invest in water infrastructure. Semarang's industries will be 100% water—neutral and will have twice the amount of jobs and of operations. Best practices established in Semarang can be scaled to the province and beyond.
ACTORS NECESSARY STEPS	<p><b>GOVERNMENT</b></p> <ol style="list-style-type: none"> <li>1. Improve enforcement capacity through ESDM and DLH integrating industrial operation permit with groundwater use.</li> <li>2. Improve data collection and monitoring of water use in general.</li> <li>3. Build capacity of local government in land and tax based instruments to produce outcomes required.</li> </ol> <p><b>INDUSTRIAL CLUSTERS</b></p> <ol style="list-style-type: none"> <li>1. Greater awareness of issues and long term thinking.</li> <li>2. Organizational capacity to negotiate and bargain in land consolidation/readjustment process.</li> </ol> <p><b>CITIZENS (LABOR)</b></p> <ol style="list-style-type: none"> <li>1. Skills training to prepare for high added value industries.</li> </ol>		
FUNDING / FINANCE	<p><b>Initial funding sources</b></p> <ul style="list-style-type: none"> <li>Grants (IDB, GCF, and others)</li> <li>Philanthropy</li> <li>Private Investment / CSR from Industries</li> <li>Earmarking existing (local) taxes</li> <li>Introducing a special purpose tax</li> </ul>	<p><b>Financing mechanisms</b></p> <ul style="list-style-type: none"> <li>Attracting investment with government incentives.</li> <li>Incentivize exiting businesses to upgrade with government regulations &amp; incentives.</li> </ul>	
PROGRAM RISKS	<p><b>Scale of area development is too big and risky to be attractive for prospective investors.</b> Government can provide regulatory environment (i.e. enforcement) as well as tax based incentives to make investments more viable and attractive. Can be done in phases.</p> <p><b>Existing labor capacity/human resources cannot fulfill the needs higher added value industries.</b> Process needs to include the existing tenants and landowners from the start. The program should aim to create a participatory process to align vision and expectations.</p> <p><b>Existing Industrial Cluster tenants and landowners refuse to participate, possibly with backlash.</b> Part of creating an enabling environment is an initial investment in training and knowledge transfer of industry labor.</p>		

# water—neutral industry pilot in genuk

## PILOT PROJECT PROPOSAL

### COSTS

#### PROJECT COMPONENTS AND SCOPE

##### 1. LAND DEVELOPMENT AND REVITALIZATION

Comprehensive revitalization of approximately 750 Ha of industrial land with mixed urban area. An acquisition or transfer of operations and maintenance of industrial clusters of approximately 380 existing industrial facilities. Creation of new parcels through land use optimization, densification, and reclamation. (Reorganization of land use and re-parcelization / Reclamation / Land Acquisition and Consolidation / Integration of public amenities and parks / Acquisition of management and operations of industrial clusters)

##### 2. CIVIL IMPROVEMENTS

Integrated flood protection; Upgraded infrastructure of re-acquisitioned industrial clusters. (Levee structure along east bank of the River / Elevated roadway to complete polder / Reconstructed roadways)

##### 3. CIRCULAR WATER FLOWS

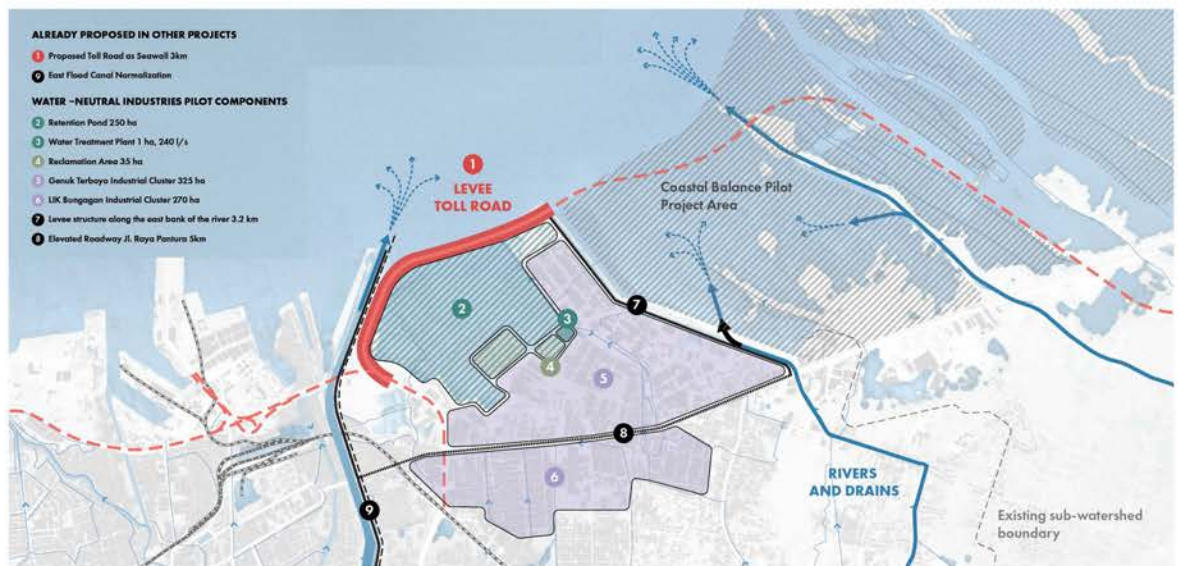
Provide comprehensive system to treat, recycle, and reuse waste-water from industrial processes. Capture an average of 240l/s of water, providing efficient storage to overcome dry season and distribution of 312l/s of water. (Waste Water Treatment Plant approx. 1 Ha / Retention Pond 250 Ha / Localized Stormwater Detention / Green Infrastructure / Distribution & Collection, Piping / Pumping facilities as needed)

##### 4. CIRCULAR WASTE FLOWS

Waste collection and disposal services in combination with waste stream analysis to identify, collect, and distribute byproducts that can be utilized by other industries within the park. (Central Waste Collection & Processing Facility / Material Stream audit of constituent companies)

##### 5. SOFT COSTS

Initial and ongoing cost items. (Pre-feasibility Study / Design and Engineering / Financing / Institutional Reorganization and Development / Ling-Term Management / Operations and Maintenance / Public advocacy and engagement)



### BENEFITS

#### CLIMATE AND ENVIRONMENTAL IMPACT

1. Securing groundwater resources and health of deep aquifers by reducing groundwater extraction (7,600,000 m<sup>3</sup>/year)
2. Reduce CO<sub>2</sub> emissions from reduction of diesel-based water pumping in the long run by reducing the future pressure on pumps further land subsidence
3. Shorter water supply chain, and by extension a reduction in transportation costs and emissions
4. Reduction of environmental pollution in water bodies i.e. prevention of direct discharge to the rivers and seas

#### ECONOMIC IMPACT

1. New sources of revenue from development and new investments in industry
2. Reduced risks (lower replacement costs, and insurance premiums)
3. Avoided business disruptions from floods and water shortage for 380 industrial businesses in Genuk
4. Potential to attract investment from environmentally conscious companies
5. Optimized land use leads to potential higher value development and attract investments for higher value industrial operations
6. Long term cost savings due to efficiencies in water and energy
7. Securing 30,000 jobs by sustainable industrial development
8. Increase value added multiplier of jobs
9. Potential for manufacturing businesses to move higher in the value chain
10. Optimized and efficient logistics
11. New potential services for industrial water supply and treatment

#### SOCIAL IMPACT

1. Job Security
2. Increased quality of life and safety for surrounding communities and workers from improved infrastructure and public realm
3. Healthier environment for surrounding communities due to reduced environmental pollution and better water supply leads to medical cost savings and reduction of sick days leads to improved productivity and savings
4. Improved water governance and operational capacity of municipal water company

# network of resilient kampungs

PROGRAM PROPOSAL  
APRIL 2019

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## PROGRAM DESCRIPTION

Program that incentivizes a decentralized approach to investments in green infrastructure for water, waste and energy in the kampungs. The program will leverage existing community action planning and participatory budgeting process integrating resilience and risk mitigation planning. It enables a sense of ecological citizenship, participatory water planning, stewardship of shared resources and most importantly accelerate infrastructure improvement for the city.

## RATIONALE

Current programs at the neighborhood scale focus largely on capacity building and disaster preparedness. Most underserved areas often lack the much needed infrastructure for water security and flood management and have to wait for lengthy budgeting cycles. The program looks to prioritize the development of resilient infrastructure systems through a community driven process.

## KEY OBJECTIVES

This program aims to address a range of current issues: Water-related issues include flooding, landslides, groundwater extraction, water access and wastewater treatment. Other issues include: drought, pollution, weak enforcement, lack of strong leadership, loss of cultural elements, rapid and unorganized urbanization, loss of agriculture, high cost of utilities, and rapid transition in labor sectors.

## WATER

- 1 Provide alternative sources for water supply
- 2 Stop groundwater extraction for residential uses
- 3 Reduce flooding (riverine or surface)
- 4 Reduce landslides
- 5 Promote decentralized wastewater treatment

## ENVIRONMENTAL

- 6 Improve local water and air quality
- 7 Reduce environmental pollution
- 8 Improve public health
- 9 Promote waste (garbage) separation

## SOCIAL

- 10 Promote local enforcement of regulations
- 11 Strengthen local leadership
- 12 Strengthen cultural elements
- 13 Raise awareness around water and sustainability

## ECONOMIC

- 14 Promote sustainable communities
- 15 Create job and training opportunities based on local economies and infrastructure innovation
- 16 Reduce economic damages from flood events or dry season
- 17 Reduce utility costs for households

# network of resilient kampungs

## PROGRAM PROPOSAL

### COMPONENTS

#### 1. Capacity building and institutional alignment

Capacity building at the kampung level stakeholders (facilitators, community groups and leaders) to increase their awareness and understanding on resilience issues as well as formation of water-committee to enable stewardship of the shared resources.

#### 2. Physical Interventions

Development of site specific water infrastructure to provide a decentralized alternative water supply and address water-related risks, integrated with environmental, social, and economic improvement measures.

#### 3. Targeted resource allocation and economic mechanisms

Government grant matching of the funds allocated for water infrastructure through participatory budgeting processes. Co-development with the community of an economic mechanism to sustain the implementation and maintenance of the program in the future.

	SHORT TERM	MEDIUM TERM	LONG TERM
<b>PROJECTS</b>	<p><b>[01] RESILIENT KAMPUNG GUIDE</b> Step-by-step guide for community leaders, community programs, and participatory budgeting facilitators to increase awareness and understanding on resiliency.</p> <p><b>[02] URGENT RESILIENT KAMPUNG PILOT PROJECTS (TEMBALANG)</b> Project with special focus on stormwater management in upland areas, addressing issues of landslides and riverine flooding. Site is located south of the campus of UNDIP, where flooding issues are exacerbated after the construction of the campus in 2011.</p>	<p><b>[03] RESILIENT KAMPUNG PROJECTS IN KEY FOCUS AREAS</b> <b>Terboyo/Trimulyo (Coastal)</b> Project focused on coastal resilience, stormwater management, leadership, density, and economic development.</p> <p><b>Wonosari (Riverine)</b> Project focused on riverine flooding, stormwater management and density.</p> <p><b>Nongkosawit (Upland Rural/Urban)</b> Project to address urbanization trends while preserving cultural elements around water and mitigating the risks of flooding, water access and landslides.</p>	<p><b>[04] SCALING-UP</b> In the long-term, the program scales up and helps other kampungs to form necessary leadership groups to apply for the program funding and build the capacity to planned, budget for, design and implement decentralized resiliency systems such as water supply, stormwater management and wastewater management. Interventions, processes and tools are adjusted after the previous phase of interventions to better serve the needs of the various kampung types.</p>

### ENABLING ENVIRONMENT

#### Institutional / Legal Framework

**Regulation to integrate resilient kampung programs:** Integrating the various different programs to strengthen community resilience at the kampung level under one framework for better resource allocation, lower costs and higher benefits.

**Leverage the modalities of current programs:** Some government programs already form community groups and organizational structures which can be seen as a modalities to further strengthen the resilience at the community level.

**Coordination between planning and implementing agencies:** Coordination between Bappeda, PU, DLH and PDAM to review the participatory budgeting process and synchronize the green infrastructure mechanism (water, stormwater, wastewater infrastructure) at kampung level into this process.

**Embrace community leadership at the kampung level:** Apart from current community groups that were formed as part of specific programs, Indonesia's current community organization at the lowest level (RT, RW, PKK/women group, Karang Taruna/youth group) have an immense potential as the agents of change and should be strengthened through series of capacity building efforts.

<b>EXPECTED OUTCOMES</b>	In the short term, the program will help raise awareness around sustainable communities, bring to the forefront underserved communities at risk, and strengthen local leadership and community coalition in order to prepare kampungs for the application process. A pilot project will demonstrate the success of the program.	In the medium term, successful projects in Wonosari and Nongkosawit will demonstrate tangible outcomes of the program. Based on these, a comparison between risks, costs and benefits at the city scale can be created and support an economic argument for resource allocation and the scaling-up phase.	In the long term, with established regulations and secured capital, kampungs will become part of the program and will invest in decentralized water infrastructure. Semarang's kampungs will not only mitigate risk, but also double their capacity for growth and economic development.
<b>ACTORS NECESSARY STEPS</b>	<p><b>GOVERNMENT</b></p> <ol style="list-style-type: none"> <li>1. Set up a resilient kampung fund and mechanism under the city budget predetermined for infrastructure, a matching fund to incentivize neighbourhoods to include and implement in their budget for green infrastructure.</li> <li>2. Review the participatory planning and budgeting process to insert the mechanism to access resilience kampung fund.</li> <li>3. Training for facilitators (who are already being deployed for Musrenbang) to embed knowledge of planning green infrastructure.</li> </ol>		
<b>FUNDING / FINANCE</b>	<p><b>Initial funding sources</b></p> <p>Re-prioritizing City Budget APBD Philanthropy Private Investment / CSR from Industries Earmarking existing (local) taxes</p>	<p><b>Financing mechanisms (Kelurahan level)</b></p> <p>Creative financing options with participatory budgeting process, Dana kelurahan (kelurahan budget), and/or Community Based Public Private Partnership (CBP3).</p>	<p><b>Financing mechanisms (City level)</b></p> <p>City-wide impact assessment to create an allocated trust fund for the Resilient Kampung Program.</p>
<b>PROGRAM RISKS</b>	<p><b>Weak leadership and community cohesion:</b> Key risk factors for the implementation of the program. Actions of monitoring, evaluation, institutional support, follow-ups of activities after project implementation are fundamental for the success in the long term.</p> <p><b>Lack of long term financial streams:</b> Assuring financial streams in the long term depends on a multiple factors difficult to foresee (economic variations, political trends, etc). Institutional support for finance and improvement in job sectors are needed.</p>		

# network of resilient kampungs

## PROGRAM PROPOSAL

### COSTS

#### PROJECT COMPONENTS AND SCOPE

##### 1. TECHNICAL ASSISTANCE/CAPACITY BUILDING

Technical assistance to empower local communities and local government for community-based resilience planning and integrated green infrastructure investment. (Development of a “resilient kampung” guideline and training modules / Capacity building activities of relevant government agencies, designers, engineers, local facilitators and targeted local residents)

##### 2. PHYSICAL SETTLEMENT IMPROVEMENTS

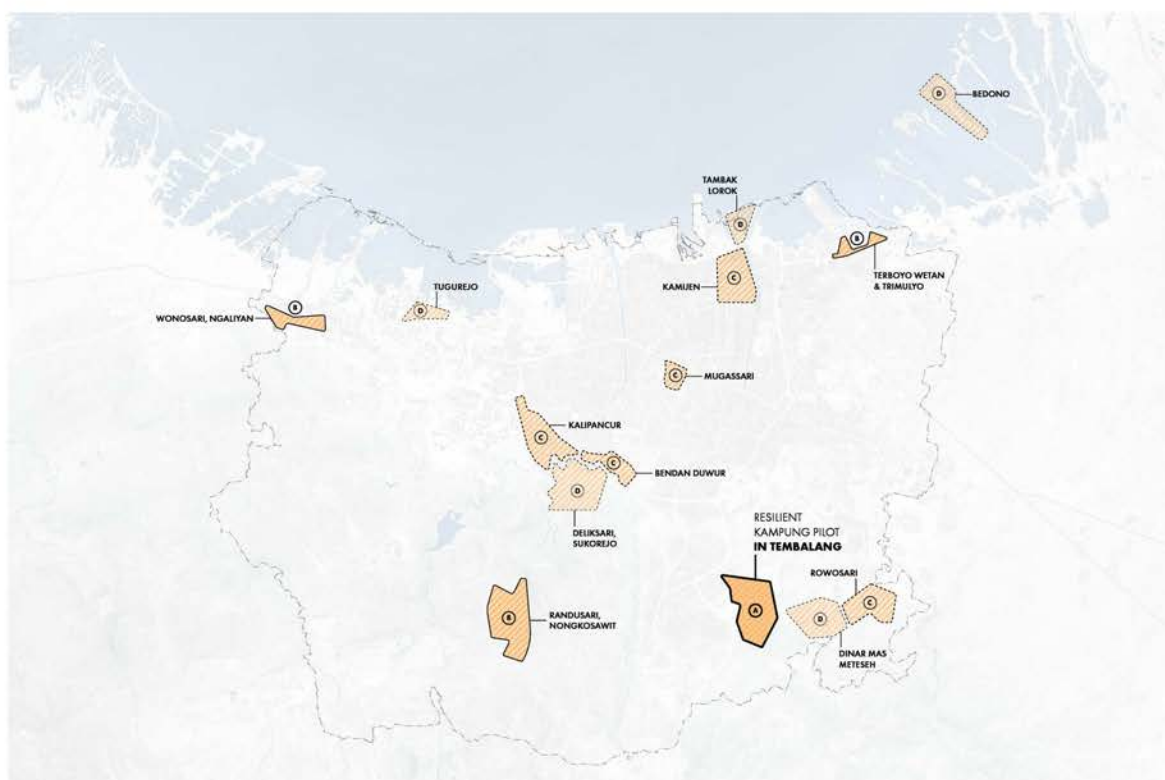
Upgraded infrastructure in designated kampungs in varying degrees. In specified pilot projects a more comprehensive area development scheme (Physical improvements may vary depending on the community based assessments, it can include infrastructure for water, solid waste, wastewater, stormwater, energy, green spaces, etc. / Larger area development strategies will also leverage strategic public and private investments)

##### 3. INSTITUTIONS FOR RESOURCE ALLOCATION

Creating institutional arrangements within the city to allocate dedicated local budget to “resilient kampung” investments (Special city budget allocation for a “resilient kampung” fund)

##### 4. OTHER SOFT COSTS

Initial and ongoing cost items. (Community-based needs assessments / Pre-feasibility Study / Design and Engineering by local entities / Public advocacy and stakeholder engagement)



### BENEFITS

#### CLIMATE AND ENVIRONMENTAL IMPACT

1. Reduced water pollution of water bodies
2. Improved stormwater management and reduced flood risks
3. Improved water storage capacity and water security in urban landscape
4. Green infrastructure (parks, nature-based treatment systems, etc.) contribute to carbon sequestration and reduction in emissions

#### ECONOMIC IMPACT

1. Reduced operational disruption of surrounding urban areas from floods
2. Improved accessibility within kampung settlements
3. Improved savings from the reduction of purchased water
4. Improved land value and development potential of improved areas
5. In the case of area development strategies, there is an opportunity for additional revenue from property taxes, land development and commercial activities

#### SOCIAL IMPACT

1. Increased quality of life and safety for surrounding communities and workers from improved infrastructure and public realm improvements.
2. Healthier environment for surrounding communities due to reduced environmental pollution and better water supply leads to medical cost savings and reduction of sick days leads to improved productivity and savings
3. Improved water governance
4. Improved local planning capacity of communities

# integrated protective coastal zone

PROGRAM PROPOSAL  
APRIL 2019

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## PROGRAM DESCRIPTION

Program to create an integrated vision and plan for a protective and productive coastal zone across Semarang, Kendal and Demak, including the development of an ecological value transfer mechanism to allow cost and profit sharing. A coastal protection approach through a combination of hard infrastructure with soft foreshores, enhancing long term industrial competitiveness, urban and rural development and biodiversity.

## RATIONALE

In the last three decades, Semarang's coastline has shifted dramatically due to rising seas, erosion, and land reclamation practices. The current mode of coastal protection is hard infrastructure that disrupts sediment dynamics along the coast and exacerbates erosion, while the flow of sediment from upland to lowland is interrupted by river dams and reservoirs. Overaccumulation of sediment causes river drainage problems and necessitates costly harbor dredging. Adding to this complexity, the diverse coastal zone from Kendal to Demak is also rife with contested land ownership and land use - at odds with protection of coastal ecology. Uncoordinated competition across municipalities to develop industrial land may also result in a economic lose-lose consequences. To achieve sustainable regional competitiveness for Central Java Province, this program stimulates the development of an integrated vision and plan for a more protective and productive coastal zone, including the development of an ecological value transfer mechanism to allow cost and profit sharing.

## KEY OBJECTIVES

### WATER

- 1 Minimize tidal flooding (rob)
- 2 Reduce impact of coastal storm flooding

### ENVIRONMENTAL

- 3 Restore shoreline
- 4 Restore ecological greenbelt
- 5 Increase sedimentation along the coast

### SOCIAL

- 6 Create a connected and accessible waterfront
- 7 Education, recreation, spiritual (grave of imam)
- 8 Enhance social cohesion and collaboration

### ECONOMIC

- 9 Protect and enhance livelihoods of coastal communities
- 10 Revive near and offshore fisheries
- 11 Promote sustainable industrial growth along the coast
- 12 Promote sustainable communities and new developments
- 13 Protect critical economic infrastructure (port, rail, airport)

### GOVERNANCE

- 14 Integrated plan and vision for coastal zone at metropolitan level

Water for  
as Resilient Cities  
Leverage Asia

one  
IQBAL REZA  
CINDY RISWANTO  
STEFANUS KRISTANTO

KOTAKITA  
A CITY FOR ALL  
The Nature  
Conservancy

Deltares  
Creating Delta Life  
atelier ten

Wetlands  
INTERNATIONAL  
UNDIP

SHERWOOD  
DESIGN ENGINEERS  
Penn

# integrated protective coastal zone

## PROGRAM PROPOSAL

### COMPONENTS

#### 1. INTEGRATED VISION

Convene stakeholders to formulate and implement an integrated vision and plan for a protective and productive coastal zone across Semarang, Kendal and Demak, balancing urban development (industrial and port) and ecological restoration to enhance coastal protection, while creating additional benefits in terms of eco-tourism, fisheries, and carbon sequestration.

#### 2. ECOLOGICAL VALUE TRANSFER MECHANISM

Mechanism between urban land and ecological restoration zones along the coast. Costs in gray infrastructure for coastal protection and revenue from development is shared between municipalities in order to commit to an integrated approach. Revenues would not only be directed to maintenance, but also to greenbelt restoration and to neighboring communities to compensate for damage caused by extraction.

	SHORT TERM	MEDIUM TERM	LONG TERM
PROJECTS	<p><b>[01] COASTAL BALANCE PILOT GENUK/SAYUNG AREA</b></p> <p>Project that combines hard infrastructure with soft mangrove foreshores through the modification of the current toll road to Demak proposal. The project aims to provide coastal protection, redirect and manage sediment supply, enhance the livelihood of communities and provide opportunities for local and regional economic growth. Tangible measures include the modification of the planned toll road to include an elevated section with an ecotourism island, that enables sediment capture and mangrove restoration. To better connect with Demak, components include a large Mangrove and Fisheries Park.</p> <p><i>see next page for details</i></p>	<p><b>[02] FUTURE-READY PORT</b></p> <p>Tanjung Emas Port masterplan update with expansion of operations, breakwaters with sediment capture areas to create soft (mangrove) foreshores, facilities modernization, drainage strategies, flood protection strategies, and more cost-effective dredging strategies due to local reuse of sediment instead of offshore transport of sediment.</p> <p><i>see next page for details</i></p>	<p><b>[03] WEST SEMARANG SOFT SHORELINE INFRASTRUCTURE</b></p> <p>Cross-boundary project with combination of hard and soft coastal protection measures that links logistical and ecological efforts between West Semarang and Kendal. Due to the longer time frame this projects allows for adequate planning and testing of alternative approaches to coastal protection that include green measures.</p>

### ENABLING ENVIRONMENT

#### Institutional / Legal Framework

**Land Use Vision:** Committed vision and land use coordination, especially for industrial development and reclamation with regard to distribution and use of water and sediment, from the provincial government for Kendal, Semarang and Demak from upland to lowland.

**Ecological Value Determination:** Commitment of a quantified ecological value along the coast in order to establish a transfer quota.

**Land ownership:** Cooperation of land owners and stakeholders along the coast via a committed and operational forum.

**Mangrove conservation and restoration:** Enforce protection and restoration of mangrove greenbelts in line with the Presidential greenbelt law and the National Mangrove Strategy. Regulate use rights in a community based mangrove management plans. Establish a large Mangrove & Fisheries Park NE of Semarang.

**Economic activities monitoring:** Regulate fisheries to prevent overfishing, and industries to prevent unsustainable practices.

#### EXPECTED OUTCOMES

In the short term, a coordinated and planning process across the municipalities will be established. Strategies regarding coastal protection, sediment supply, groundwater extraction and economic growth will be identified and will guide the creation of a preferred coastal vision.

In the medium term, a successful project in Tanjung Emas Port will establish Semarang's position as a leading economic center in Central Java and will attract investment for subsequent coastal projects and restoration efforts. The costs for maintaining breakwaters and dredging operations will have been reduced due to local reuse of sediment for the protective soft foreshore.

In the long term, comprehensive ecological restorations in designated areas and sustainable protective systems of urban coastal areas will be implemented. There will be reduction in polder and dyke maintenance and up-keeping.

#### ACTORS NECESSARY STEPS

##### GOVERNMENT

1. Establish a cross-municipal entity for the oversight of land use coordination and planning
2. Develop a method for accounting of ecological value and industrial development-port capacity
3. Develop incentives for compliance

#### FUNDING / FINANCE

##### Initial funding sources

Grants (IDB, GCF, and others)  
Philanthropy  
Private Investment / CSR from Industries  
Earmarking existing (local) taxes  
Introducing a special purpose tax

##### Financing mechanisms

Ecological Value transfer mechanism  
  
Incentivize exiting businesses to integrate green/grey measures with government regulations & incentives.

#### PROGRAM RISKS

**Land acquisition costs become too high for local government.** Use creative incentives such as Transfer of Development Rights.

**Unwillingness of local government stakeholders to participate.** Establish strong commitment at the Provincial and National level, along with rigorous analysis of value and coast haring across stakeholder municipalities.

# coastal balance pilot in genuk/sayung

## PILOT PROJECT PROPOSAL

### COSTS

#### PROJECT COMPONENTS AND SCOPE

##### 1. LAND DEVELOPMENT

Development of industrial and urban land. 200 Ha of new polder system in Demak and also improvements of land parcels along the coastal road (Jalan Pantura). (Reorganization of land use and re-parcelization of targeted areas  
Reclamation / Land Acquisition and Consolidation / Integration of public amenities and parks)

##### 2. CIVIL IMPROVEMENTS/WATERWAY DIVERSION

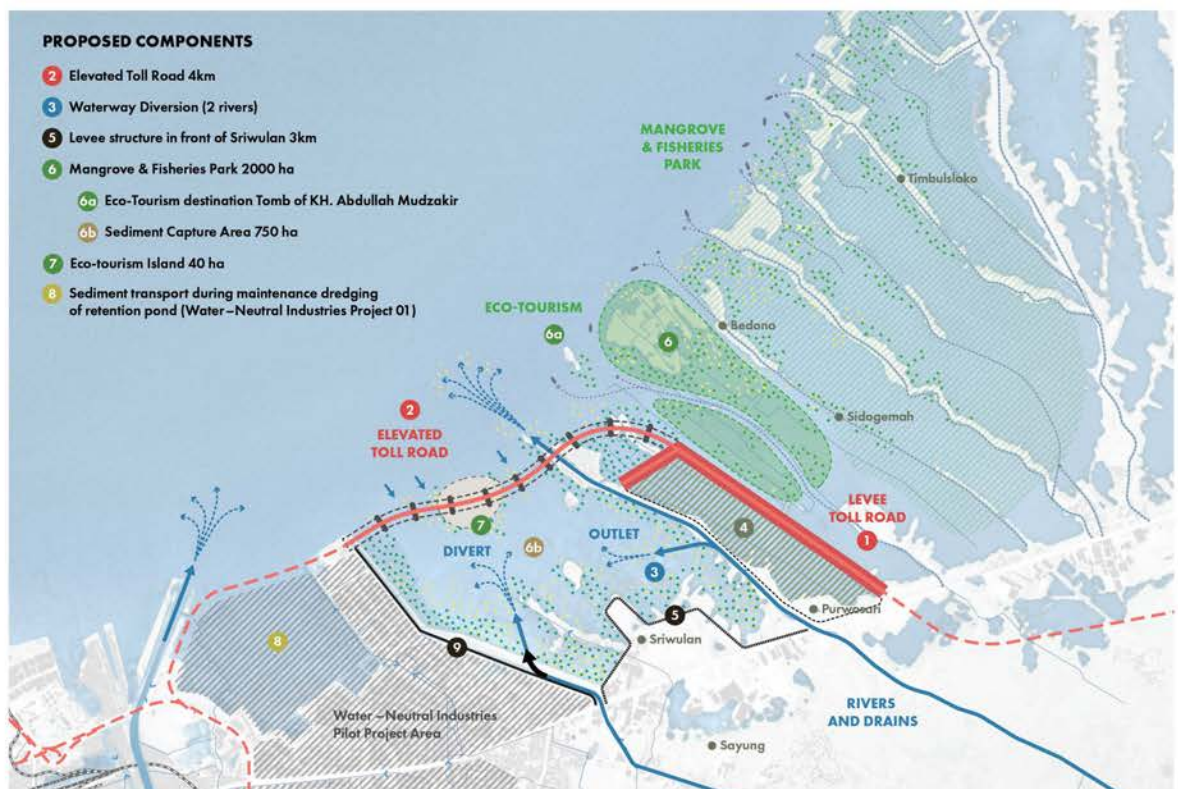
Integrated flood protection; Upgraded infrastructure of re-acquisitioned industrial clusters. (Construction of a polder system and toll road-seawall modification / Diversion of river flows to improve sediment capture)

##### 3. GREENBELT RESTORATION

Construction of mangrove parks and sediment capture systems along with public amenities. (Mangrove park / Nature-based sediment capture systems combined with breakwaters and sea dykes / Integration of public amenities such as boardwalks, jetties and recreational facilities)

##### 4. SOFT COSTS

Initial and ongoing cost items. (Pre-feasibility Study / Design and Engineering / Financing / Institutional Reorganization and Development / Long-term Management / Operations and Maintenance / Public advocacy and engagement)



### BENEFITS

#### CLIMATE AND ENVIRONMENTAL IMPACT

1. Coastal Resilience / Improved adaptive capacity to Sea Level Rise
2. Protected and enhanced local biodiversity i.e. improved marine habitat and food security through reconstruction of mangrove ecosystem and coastal greenbelt
3. Carbon capture from ecological preservation and mangrove restoration of eroded coastline
4. Reduced coastal erosion with sediment capture and greenbelt restoration in Genuk and Sayung for up to 66 bird species and 28 mangrove species

#### ECONOMIC IMPACT

1. Reduced flooding risks leads to reduced operational disruption of a major logistical corridor of Jalan Pantura
2. Increased bio-stock - wild fish up to 3500 tonnes/yr, wild shrimp up to 1500 tonnes/yr and raw materials from mangroves
3. Eco-tourism activities generate local revenues for surrounding businesses and village business units
4. Avoided cost of pumping operations in previously designed polder system
5. Toll road connectivity to land development can improve concession viability and revenue from tariffs
6. Optimized land use leads to potential higher value development and investments in industrial operations

#### SOCIAL IMPACT

1. Improving and securing the livelihoods of existing fishing communities in Semarang and Demak
2. Securing cultural heritage and social values of historic communities along the coast of Demak
3. Land redevelopment can improve living conditions of existing villages and therefore improving quality of health and life
4. Improved coastal governance process through ecological transfer process

# future-ready port tanjung emas

## PHASE 2 PROJECT PROPOSAL

### COSTS

#### PROJECT COMPONENTS AND SCOPE

##### 1. INTEGRATED HARBOR PROTECTIVE SYSTEM

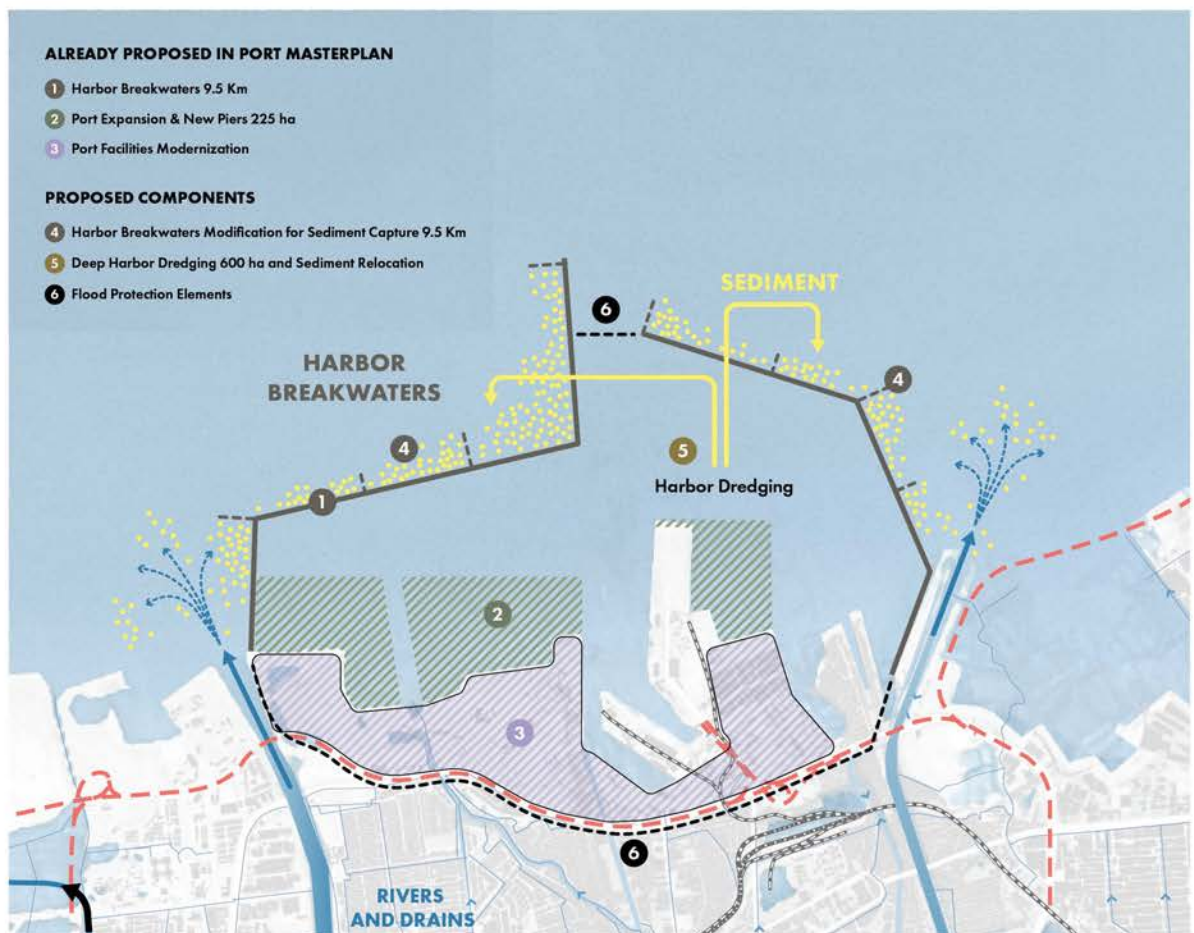
Comprehensive development of an updated coastal protection system for the port of Semarang including deep harbor 600 Ha dredging and use of sediment for restoration, mangrove restoration and modifications of existing breakwaters. (Dredging / Sediment transport and relocation / Mangrove planting and management / Breakwater modification)

##### 2. PORT EXPANSION AND MODERNIZATION

Development of up to 225 Ha of new reclaimed land for port operations per the masterplan. (Land reclamation and associated civil work / Port operations and building of port facilities like offices, cranes, new terminals, etc.)

##### 3. SOFT COSTS

Initial and ongoing cost items. (Pre-feasibility Study / Design and Engineering / Financing Institutional Reorganization and Development / Long-term Management / Operations and Maintenance / Public advocacy and engagement)



### BENEFITS

#### CLIMATE AND ENVIRONMENTAL IMPACT

1. Coastal Resilience / Improved adaptive capacity to Sea Level Rise
2. Protected and enhanced local biodiversity i.e. improved marine habitat and food security through reconstruction of mangrove ecosystem and coastal greenbelt
3. Carbon capture from ecological preservation and mangrove restoration of eroded coastline
4. Reduced impact of abrasion in adjacent coastal zone

#### ECONOMIC IMPACT

1. Reduced risks (lower replacement costs, and insurance premiums)
2. Avoided port operations disruptions
3. Long term cost savings due to efficiencies in energy
4. Long term cost savings due to avoidance of continuous platform elevation
5. Long term cost savings due to maintenance and repair costs
6. Increase number of jobs
7. Increase higher value jobs
8. Potential for development of higher value logistic-related industries
9. Increased capacity for trade and logistics

#### SOCIAL IMPACT

1. Secure and better paying jobs
2. Increased quality of life and safety for surrounding communities due to ecological restoration
3. Healthier environment for surrounding communities due to reduced environmental pollution