Transforming Solid Waste into Resource

Project: Resilient Cities

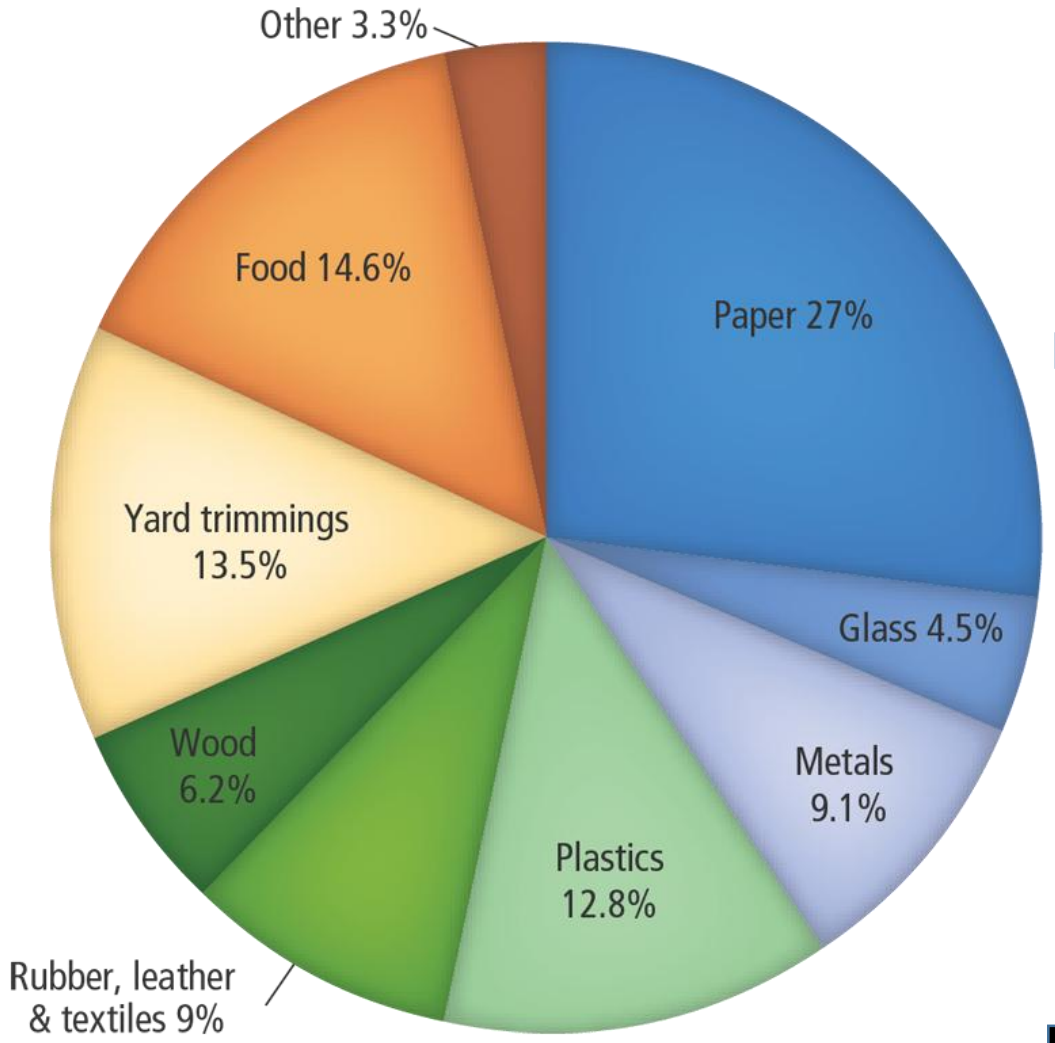
Date: 3rd May 2024

Updated – 13 April 2025

Presented by

Rhino Machines – Manish Kothari

Municipal Solid Wastes – an overview



Source: https://archive.epa.gov/epawaste/nonhaz/municipal/web/html/

Waste	General Status
Paper	Being recycled
Glass	Being recycled
Metals	Is remelted and reused
Plastics	Challenge for Low Value Plastics
Wood	Is being recycled, reused
Rubber, leather, textiles	Challenges to collect, technology goes in landfill
Yard trimmings (leaves/twigs)	Not fully addressed. Is being burnt
Food	Solutions Available
Other (Foundry Dust and Sand, Fly Ash, etc	Some solutions available. Dust is an issue.

11 SUSTAINABLE CITIES AND COMMUNITIES

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17 PARTNERSHIPS FOR THE GOALS

Transforming Dust & Low Value Plastic Waste to Resource

Plastic Waste
Mixed & LVP

1 PET
2 HDPE
7 OTHER
4 LDPE
5 PP

Sand Reclamation

70% Recycled Resource

30%
New Resource

Reclaimed Sand

Resin Coated Sand

New Sand

Exothermic Chemical

Core

Green Sand Mixer

Mould

Bentonite & Coal Dust

4
Broken – Reject Cores

Foundry
1 MT casting = 800 kg Solid Discard

3
Excess Sand

Sand

Casting with Core

2
Sand Lumps

1
Decoring Sand

Decoring

Casting

30 %

Shredded Plastic Waste 20-25%

Dust & Fines 75– 80%

Rhino
Silica Plastic Blocks Plant

Waste to Wealth

WW-SPB

Recycle & Reuse

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Waste is not a LIABILITY

Waste is an ASSET

Silica Plastic Block Project Stake Holders (Public Private Partnership)

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Waste Plastic Collection

- Community
- Industry
- Urban Local Body / Village /

Sand & Dust Waste

- Foundry Industry
- Construction Industry
- Mining Industry

Technology

- SPB Shredding, Heating & Melting, Hydraulic Press, Dies

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Production

- Community – common facility
- Social Enterprise
- Commercial Enterprise

Product

- Construction – pavers, blocks,
- Consumer articles, gifts, planters
- Interior Design & Furnitures
- Electrical enclosures

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Input Materials → Processing Plant → Products

The SPB Technology

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Waste to Wealth — WW-SPB — Recycle & Reuse

70-80%
Sand & Fine Dust

1 PET
2 HDPE
4 LDPE
5 PP

20-30%
Mixed Plastic

Shredder — Mixing & Conveying — Extrusion — Moulding

Paving Industry

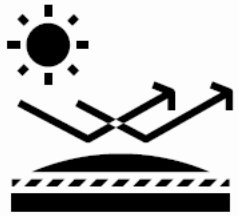
Tables & Chairs

Silica Plastic Blocks – Salient Material Characteristics

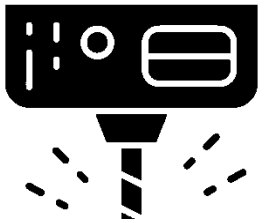
Composite mix of **plastic waste** and **Industry Silica Waste** to replace traditional material with green material by using wasted resources.

Moisture Resistant

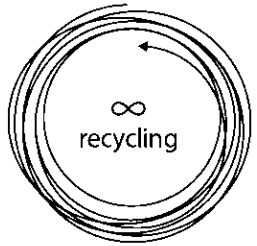
Termite Resistant



UV Resistant

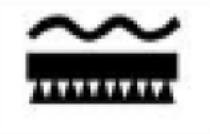


Machinable



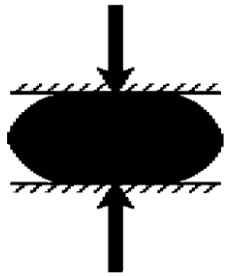
Recyclable

Frost Resistant



Abrasion Resistant

Carbon Negative



Good Compressive Strength

Uses Mixed Plastic

Silica Plastic Blocks – Business Models

The project can align from very small scale to large scale production units with different product lines

	Compact - SPB 10	Medium – SPB 100	Large – SPB 250
Output kg/hr	10 kg/hr – 3 MT/month	100 kg/hr – 40 MT/month	250 kg/hr – 100 MT/month
Location	Village/Ward Level	Nagarpalika / Semi-urban	District / Urban / Industry
Direct Employment	4 to 5	15-20	20-30
Product weight range	30 to 1500 grams	0.5 kg to 7 kg	2 kg to 18 kgs
Product profile	Upto 1500 grams Planters, coasters, bricks, pavers	Planks, Pavers, Bricks, Hollow blocks, Tiles, Heater Base	Multi cavity SPB 100 products, gratings, manhole covers

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Pilots Implemented
Industry Model: Silica Plastic Block – Foundry Installation
AIA Engineering, Ahmedabad – 100 kg/hr

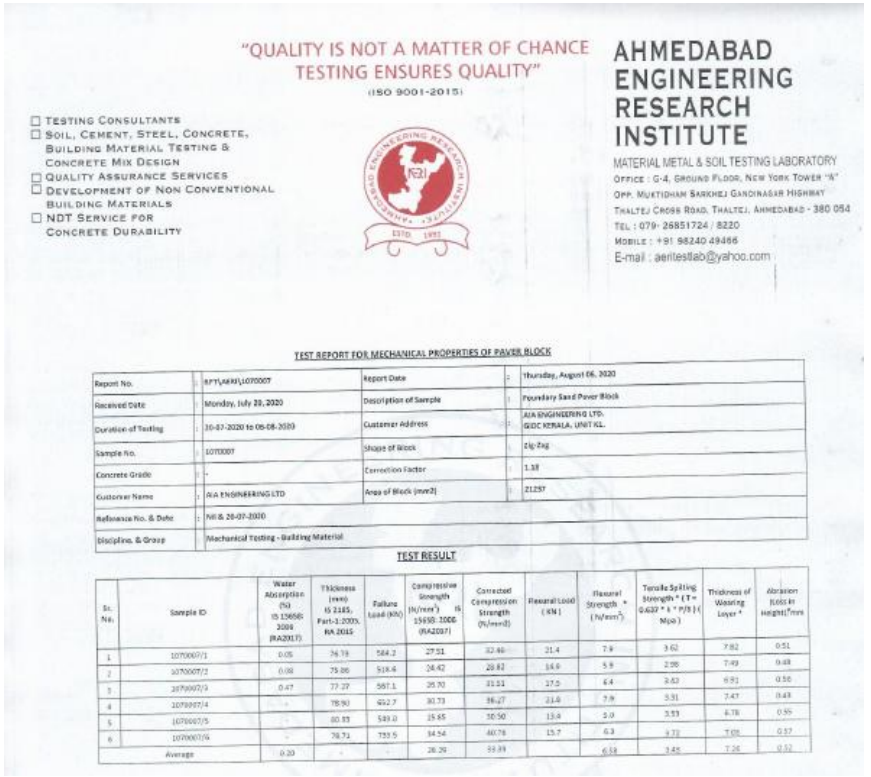
Pilot to validate project viability with Foundry Dust and HDPE Bags

First industry model

Ordered during COVID-19 - 2021

Successfully implemented and operated

Products made Paver Blocks and Bricks



"QUALITY IS NOT A MATTER OF CHANCE TESTING ENSURES QUALITY"
(ISO 9001-2015)

AHMEDABAD ENGINEERING RESEARCH INSTITUTE
MATERIAL METAL & SOIL TESTING LABORATORY

TEST REPORT FOR MECHANICAL PROPERTIES OF PAVER BLOCK

TEST RESULT

Upto 33.39 N/mm2 Compressive Strength
0.2% water absorption,
6.58 N/mm2 Flexural Strength
Abrasion – 0.52 mm
Input – HDPE Bags & Waste Dust – AIA Engineering

100 kg/hr : 19 Jan 2021

Paver Blocks – 60 Ton Trailer Road

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Pilots Implemented

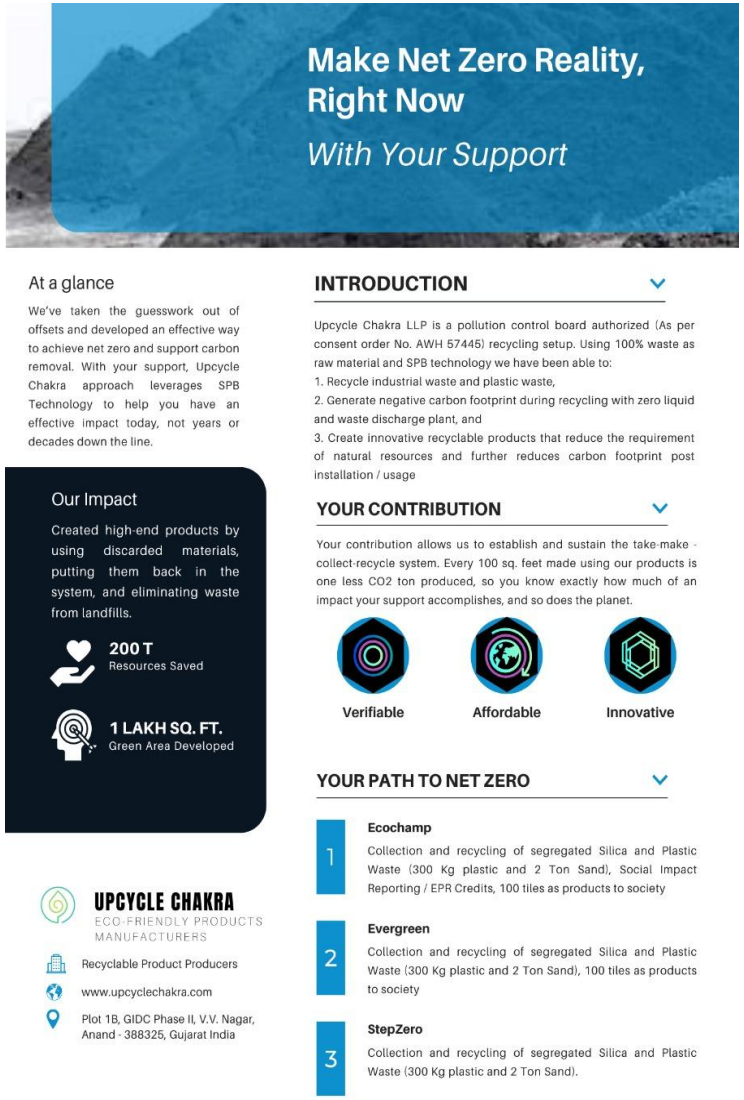
Startup : Silica Plastic Block – Construction Industry Products

Green Banana Workspace – Upcycle Chakra

Team SHUNYA, IIT Bombay
2K followers
7mo •

Circular econonmy is not just the three R's but an advanced version involving sustainability, closed loops, and renewables. It is an act of making closed material cycles and forming a network of players in the economy to run the society environmentally friendly. Here at Team SHUNYA we provide a solution for residential buildings to be in the loop of a circular economy by using recycled materials like silica plastics blocks for the floor, Ecoboard panels for walls and roof of the house and many more. Do give the articles a read if you are curious to know more about circular economy

#circulareconomy #sustainability #zerowaste #sustainable #recycle #sustainableliving #ecofriendly #reuse #sustainablefashion #environment #recycling #climatechange #plasticfree #circularfashion #slowfashion #design #eco #reducereuserecycle #innovation #economiacircular #savetheplanet #upcycle #sustainabledesign #reduce #circulardesign #upcycling #nature #plasticpollution #green #fashion
National Renewable Energy Laboratory
Upcycle Chakra
Solar Decathlon India india



Silica Plastic Block has been confirmed to following tests for construction use

- Compressive Test
- Water absorption
- Efflorescence
- Dimensional
- Abrasion Resistance

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Pilots Implemented
Rural Development : Community Model - Initiated 20 Feb 2025

Objectives

- ✓ Reuse and repurpose wasted resources into usable products
- ✓ Facility for environmental awareness and education, recycling practices and training, internship, apprenticeship, and incubation.
- ✓ Provide opportunities for women / underprivileged or marginalized communities with access to livelihood in a formal economy
- ✓ Demonstrate a replicable Investible asset that can digest social impact investment, promote equitable distribution of income amongst stakeholders

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Pilots Implemented

MSME : Silica Plastic Block – Sustainable Lifestyle Products

Meemansa (GPCB CTE Received) – Commissioned 1 April 2024

Provisional Consent Order (CTE)

Consent No. CTE-133227 Valid upto: 27/02/2031

Gujarat Pollution Control Board
Paryavaran Bhavan, Sector-10/A,
Gandhinagar - 382010
Tele : 23222756

Application : CtE:CTE-Fresh, No. 305520 Dt. 29/02/2024, Granted On: 22/03/2024 | PCB Id:97870

To,
M/s. Meemansa,
Plot No.1 B ,Phase II, GIDC Estate,, Plot No.1 B ,Phase II, GIDC Estate, Vithal Udhyog nagar- 388325 , Di. Anand ,Gujarat,
Plot No.1 B ,Phase II, GIDC Estate, Vithal Udhyog nagar- 388325 , Di. Anand ,Gujarat,City : Anand,
Dist : Anand, Tal : Anand, SIDC : Vitthal Udyogngr
Phone : 9227124977

SUB: Consent to Establish (NOC) under Section 25 of
REF: Your Application No.(CtE:CTE-Fresh) 305520 and Dated 29/02/2024

Without prejudice to the powers of this Board under the Water (Prevention and Control of Pollution) Act-1974, the Air Act-1981 and the Environment (Protection) Act-1986 and without reducing your responsibilities under the said Acts in any way, this is to inform you that this Board grants Consent to Establish for setting up of an industrial plant/activities at Plot No.1 B ,Phase II, GIDC Estate, Vithal Udhyog nagar- 388325 , Di. Anand ,Gujarat Plot No.1 B ,Phase II, GIDC Estate, Vithal Udhyog nagar- 388325 , Di. Anand ,Gujarat, Anand, Anand , Anand, Phone No. 9227124977 for the manufacturing of the items/products as mentioned in the detailed order

Every 100 grams of SPB saves 10 plastic bags from landfill

REPURPOSED PLASTIC, DUST, TEXTILE CREATIONS

- ✓ Indoor Planters
- ✓ Succulent Planters
- ✓ Trays
- ✓ Coasters
- ✓ Wall Interiors
- ✓ Fridge Magnets
- ✓ Fab-Sleeve Planters
- ✓ Lamp Shades
- ✓ Pen Stand

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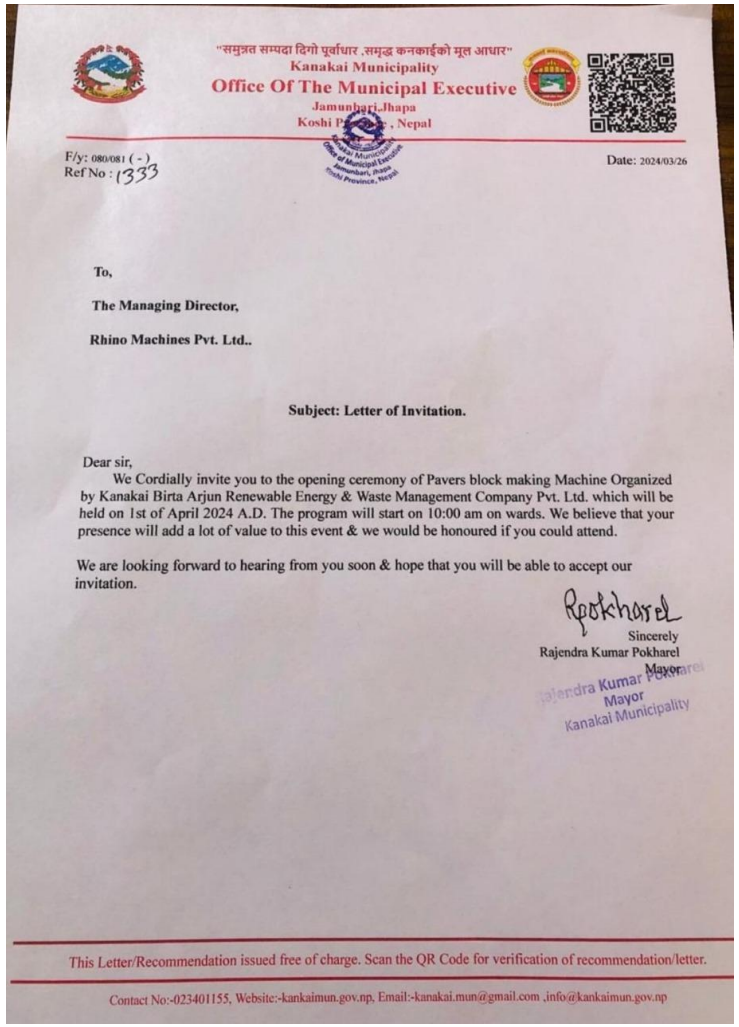
Pilots Implemented
Urban Local Body : Silica Plastic Block – Paver Block Project
Kankai Municipality – Jhapa Nepal – Commissioned 1 April 2024



"समुन्नत सम्पदा दिगो पूर्वाधार ,समृद्ध कनकाईको मूल आधार"
Kanakai Municipality
Office Of The Municipal Executive
Jamunbari, Jhapa
Koshi Province, Nepal

F/y: 080/081 (-)
Ref No : 1333

Date: 2024/03/26

To,

The Managing Director,

Rhino Machines Pvt. Ltd..

Subject: Letter of Invitation.

Dear sir,

We Cordially invite you to the opening ceremony of Pavers block making Machine Organized by Kanakai Birta Arjun Renewable Energy & Waste Management Company Pvt. Ltd. which will be held on 1st of April 2024 A.D. The program will start on 10:00 am on wards. We believe that your presence will add a lot of value to this event & we would be honoured if you could attend.

We are looking forward to hearing from you soon & hope that you will be able to accept our invitation.

Sincerely
Rajendra Kumar Pokharel
Mayor
Kanakai Municipality

This Letter/Recommendation issued free of charge. Scan the QR Code for verification of recommendation/letter.

Contact No:-023401155, Website:-kankaimun.gov.np, Email:-kankai.mun@gmail.com ,info@kankaimun.gov.np

बिर्तामोड । कनकाई-बिर्ता-अर्जुन नविकरणीय उर्जा तथा फोहोरमैला व्यवस्थापन कम्पनीले ब्लक (पेवर्स) को उत्पादन सुरु गरेको छ । सोमवार एक कार्यक्रमका बीच प्लाष्टिकबाट पेवर्स बनाउने मेसिनको उद्घाटन गरिएको छ । कनकाई नगरपालिकाका प्रमुख राजेन्द्र पोखरेलले पवर्स बनाउने मेसिनको उद्घाटन गरेको हुन् । उद्घाटनसँगै उत्पादन पनि सुरु गरिएको छ ।

फोहोर व्यवस्थापनसँगै बायोग्यास उत्पादन गरिरहेको नविकरणीय उर्जा परियोजनाले प्लाष्टिकजन्य फोहोरबाट पेवर्स उत्पादन सुरु गरेको हो । एक हप्ता परीक्षणकालिन उत्पादन गर्ने बताइएको छ ।

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Pilots Implemented

Cross-border Startup : Silica Plastic Block – Collaborative Project

Circular Seed Pty Ltd, Perth, Australia

Colloboration to synergise decentralised recycling experiences of Circular Seed and SPB technology and product development experience of Rhino Machines.
Commissioned 2024

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Pilots Implemented

Indian Startup : Silica Plastic Block – R.I.P.E. Project

Spreco Recycling (OPC) Pvt Ltd, Chennai

Synergising inclusive and formal waste management ecosystem expertise of Spreco with SPB technology and operational experience. The first RIPE (Resourcing and Incubating Promising Entrepreneurs) project by Rhino Machines

Project under commissioning - 2025

SDGs (Sustainable Development Goals)

Silica Plastic Block could connect to several SDGs – using the challenge of waste as an opportunity for Sustainable Development

Primary Impact

- Creating positive climate action (SDG13)
- Lifting resource utilization (SDG12)
- Creating wealth (SDG8)
- Sustainable products for building & construction (SDG11)

Secondary Impact

- Innovation in use of SPB (SDG9)
- Improving life on land (SDG 15)
- Reducing water pollution (SDG 14)
- Opportunity for women in recycling (SDG 5)
- Reducing poverty through wasted resources (SDG 1)
- Better health and hygiene (SDG 3)
- Reducing water contamination and water use (SDG 6)

Overall Impact

- Reducing economic and opportunity equality (SDG 10)
- Peace through economic activity (SDG 16)
- Partnerships for the goals (SDG 17)

4 Pillars of Sustainable Business - Present Status of SPB (28 April 2024)

Technology

- **Done**
  - Process, production, input supply chain, operations demonstrated
- **To Do**
  - Material characteristic certification
  - Thermal, insulation, fire resistance, leaching properties testing
  - Carbon credit measurement and certification

Finance

- **Done**
  - DPR / Business plan frameworks prepared for commercial, PPP, development, CSR
- **To Do**
  - Value chain modelling and income distribution model
  - Impact measurement across social, economic, environment, institutional indicators

Market

- **Done**
  - Product development for Construction, Lifestyle products developed
- **To Do**
  - Identify market where the material can be better, cheaper and faster to build a natural demand
  - Establish institutional or policy for use of recycled products

Culture

- **Done**
  - Subscribed to entrepreneurship and culture development program of UNTAD – Empretec
  - Experienced entrepreneurs for hand holding project
- **To Do**
  - Establish relationships with Empretec HiEERA development program with collaborators

Other technologies / solutions being developed by Rhino

Textile Waste

- **Done**
- Upcycled side cuts, post production fabric waste, sample discards, post use waste into bags, pouches, lifestyle products
- Pilots with SHGs and NGOs

- **To Do**
  - Establish product and market fit model
  - Establish sustainable model for upcycling
  - Find technology for very fine “chindi” of textile

Yard trimmings

- **Done**
  - Testing of shredding dry leaves and trimmings into fine powder done

- **To Do**
  - Establish community level deployable models for trimming and local consumption

Sand Recycling

- **Done**
  - Pilots and commercial projects implemented for large scale foundries

- **To Do**
  - Establish common facility centres for micro/small/medium foundries
  - Reduce cost of processing through joint research with technical institutions

Suggested Steps that Nagar Palika/Nigam could initiate

Step 1

- Install 100 or 250 kg/hr paver block production facility
- Install decentralized shredding centres – build awareness for segregation at source, reduce cost of segregation, involve community
- Establish use case of paver blocks/ bricks for technical, commercial and sustainability
- Establish 10 kg/hr compact model for training, awareness and lifestyle products

Step 2

- Learnings from Pilots to be used for establishing plants in different regions, local waste, local consumption sustainable business models
- Establish tech-entrepreneurship program, incubate entrepreneurs around solid waste technologies, for large scale deployment

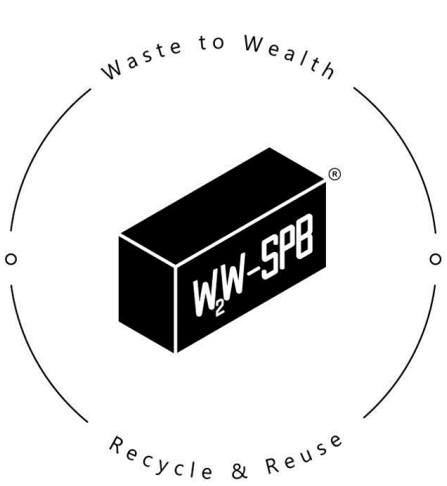
THANK YOU

Transforming Today's Waste Into Tomorrow's Resource

I was also happy to see the work of Rhino Machines Pvt Ltd that launched the Silica Plastic Block (SPB) initiative to address the issue of waste management, focusing specifically on low-value plastic waste and foundry dust. Their technology combines plastic waste and silica industry waste to create a composite, moldable green material that can replace traditional materials like paver blocks and bricks. It is a sustainable product aimed at reducing waste while generating economic value. The initiative is structured under a Public-Private Partnership (PPP) model that leverages support from Urban Local Bodies (ULBs), corporate social responsibility (CSR) contributions, and grants.

R.A. Mashelkar

Chair, India Sanitation Coalition-FICCI Sanitation Awards, and Former Director General, Council of Scientific & Industrial Research



Rhino
MACHINES PVT. LTD.

Thank you

Rhino Machines Pvt Ltd

Plot No 1A & 1B, Survey No 434/2, GIDC Phase II, Vithal Udyognagar, Anand, Gujarat, India

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