

THE PROBLEM

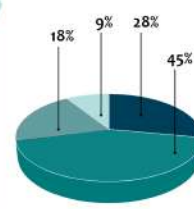
THE EVER-INCREASING POPULATION RAISES SERIOUS QUESTIONS ABOUT PROVIDING A COMFORTABLE LIFESTYLE TO THEM BUT A MORE SERIOUS PROBLEM WHICH GOES LARGELY UNNOTICED DUE TO THE FACT THAT IT IS NOT DIRECTLY RELEVANT TO ONE'S DAY TO DAY LIFE IS THAT OF THE MILLIONS OF TONS OF WASTE PRODUCED BY THIS POPULATION ON DAILY BASIS SINCE IT DOES NOT POSSESS AN IMMEDIATE THREAT, PEOPLE TEND TO IGNORE THIS VERY SERIOUS ISSUE THAT HOLDS ALMOST ALL OF THE CITIES BY THE NECK. PEOPLE WANT THE WASTE TO BE OUT OF THEIR HOUSES, BEYOND THAT, THEY DO NOT CONCERN THEMSELVES AS TO WHAT HAPPENS TO IT



DON'T LET THE WASTE GO WASTE

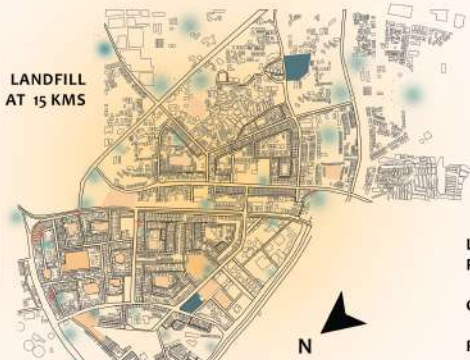
TYPES OF WASTE

SOLID	ORGANIC	RECYCLABLE	HAZARDOUS
HOUSEHOLD INDUSTRIAL PLASTIC PAPER METALS CERAMICS GLASS	FOOD GARDEN MANURE HORTICULTURE	WASTE FROM PUBLIC SPACES PLASTICS PAPER METALS	FLAMMABLE AND TOXIC MATERIAL CORROSIVE NAD CHEMICALLY REACTIVE WASTE



BRIEF INTERPRETATION

TECHNOLOGY IS A TOOL AND THEREFORE, ONLY EFFECTIVE AS THE ONE USING IT. THE NEGATIVE IMPACT OF ADVANCEMENTS IN TECHNOLOGY LIKE HARMFUL AND TOXIC EFFECTS OF POLLUTION, OVERHEATING WASTE PRODUCTION, ETC. NEED TO BE COUNTERED WITH CERTAIN COMPONENTS THAT HAVE A MORE POSITIVE IMPACT. THE MAIN PURPOSE OF TECHNOLOGY WAS TO REDUCE THE HUMAN LABOUR AND INCREASE EFFICIENCY AND ACCURACY OF PRODUCTION AS WELL AS SAVE TIME. MAKING A CITY SMART WORKS ALONG THE SAME LINE. TECHNOLOGY IS USED TO ITS MAXIMUM POTENTIAL, EVERYTHING IS MONITORED AND SAVED AS DATA WHICH COMES IN HANDY FOR FUTURE PLANS AND DEVELOPMENTS. A TRULY SMART CITY IS THE ONE WHICH USES THE PRESENT-DAY APPLICATIONS AT THEIR BEST WHILE CONSIDERING LEAVING ROOM FOR FUTURE ALTERNATIVES THAT PROVIDE BETTER OUTPUT WITH APPROXIMATELY SAME AMOUNT OF INPUT. PROBLEMS MUST BE FIRST DIAGNOSED, ANALYZED AND A SOLUTION THAT PROVIDES INTELLIGENT SERVICE MUST BE ENFORCED. IT SHOULD CO-EXIST WITH THE SOCIAL CONSTRUCT AND BRING ABOUT POSITIVE CHANGES IN THE SOCIETY AS A WHOLE.

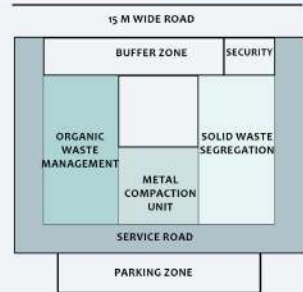


LOCATION: NEIGHBOURHOOD OF PRADHIKARAN, NIGDI, PCMC, PUNE
CITY: PUNE
RADIUS OF 5 KMS

PUBLIC SPACES	TRASH CAN LOCATIONS	COLLECTION CENTRES	POPULATION DENSITY
THERE ARE A LOT OF GARBAGE COLLECTION POINTS NEAR PUBLIC SPACES AND OPEN GROUNDS. THEY ARE REGULARLY REQUIRED TO BE CLEANED TO KEEP THE SPACES PLEASANT	TRASH CANS ARE LOCATED AT EVERY 3-2 KM RADIUS. THE AREAS WITH HIGHER POPULATION SHOW OVERFLOWING GARBAGE WHICH ISNT COLLECTED OFTEN ENOUGH.	COLLECTION CENTRES ARE GIVEN AT REGULAR INTERVALS FOR SEGREGATION WHICH IS OFTEN NEGLECTED AND THE WASTE IS SENT OFF TO THE LANDFILLS UNCHECKED.	CONGESTED LIVING SPACES TEND TO GENERATE MORE TRASH IN THE SAME AMOUNT OF SPACE AS NON-CONGESTED. THUS, MORE DIFFICULT TO CONTROL THE DISPOSING OF IT.

TRANSITION ZONE

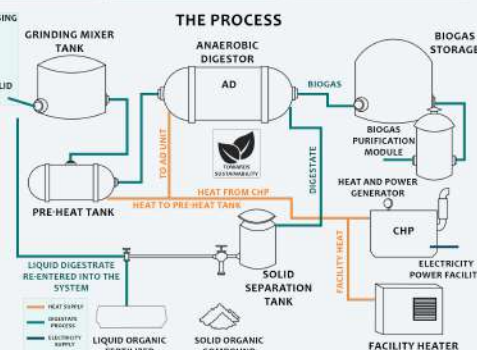
TRANSITION ZONES ARE THE SPACES THAT WE ARE GIVING AT REGULAR INTERVALS AS THE COMMON COLLECTION POINTS FOR WASTE IN A NEIGHBOURHOOD.
THE TRANSITION ZONE BECOMES THE MIDDLE GROUND BETWEEN THE WASTE GENERATING UNITS AND THE LANDFILLS.
THEY AIM TO ESTABLISH A CERTAIN AMOUNT OF CONTROL OVER THE WASTAGE OF WASTE AND USE IT IN A MORE PRODUCTIVE MANNER.
THE WASTE IS SEGREGATED AT UNIT LEVEL BY THE PRINCIPLE OF 3R'S AND THEN AGAIN AT THE TRANSITION ZONE.
USE OF TECHNOLOGY PLAYS AN IMPORTANT ROLE IN THE WHOLE PROCESS.



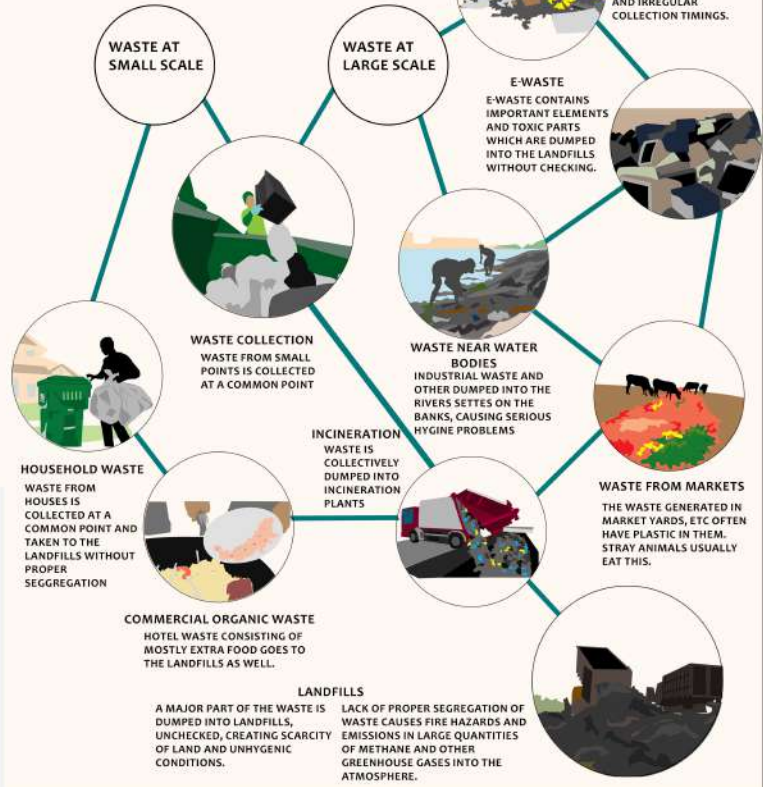
SERVICE ROAD	ORGANIC WASTE MANAGEMENT	METAL COMPACTION UNIT	SOLID WASTE SEGREGATION
TWO SERVICE ROADS ARE PROVIDED ON EITHER SIDE OF THE TRANSITION ZONE THAT LEAD TO THE PARKING LOT ON THE LEeward SIDE. BIODEGRADABLE WASTE FROM FROM SMALLER VEHICLES IS FILLED INTO THE LARGER TRUCKS IN THE PARKING AREA. SENSORS IN THE VEHICLES NOTIFY WHEN THEY ARE FULL AND MOVE OUT TO THE BIOMETHANATION PLANTS	ORGANIC WASTE IS SEPERATED FROM THE REST OF THE SOLID WASTE WHERE IT GOES TO THE LONG DISTANCE TRANSPORTATION TRUCKS. WEIGHT AND LEVEL SENSORS DETECT WHEN THE TRUCKS ARE FULL AND THE AUTHORITIES ARE NOTIFIED. THE TRUCKS ARE THEN TAKEN TO THE BIOMETHANATION PLANT WHERE IT IS CONVERTED TO ENERGY AND FUEL.	METAL WASTE IS PASSED THROUGH CONVEYOR BELTS AND COMPACTED INTO MANAGABLE, EVEN SIZES. THE E-WASTE IS ALSO DISMANTLED, SEPERATING THE IMPORTANT ELEMENTS AND TOXIC PARTS EFFECTIVELY.	WASTE WHICH IS SEGREGATED USING THE 3R SYSTEM IS BROUGHT TO THE SESEGREGATION UNIT TO BE CROSS-CHECKED. PLASTIC IS TAKEN AWAY FROM THIS WASTE TO BE TAKEN TO THE RECYCLING UNITS.

BIO- METHANATION

BIOMETHANATION IS A PROCESS BY WHICH ORGANIC MATERIAL IS MICROBIOLOGICALLY CONVERTED UNDER ANAEROBIC CONDITIONS TO BIOGAS.
THE COMPRESSED BIOGAS (CBG) RELEASED THROUGH THIS PROCESS CAN BE A SUBSTITUTE FOR LPG, CNG, ETC.
OUT OF THE WASTE, 30% IS TURNED INTO CBG AND THE REMAINING IS HEAT WHICH CAN BE USED TO PRODUCE ENERGY.
THIS IS AN EXCELLENT ALTERNATIVE TO DUMPING ORGANIC WASTE INTO LANDFILLS AS IT BECOMES A SOURCE OF ENERGY AND, THUS OF INCOME.



EXISTING SOLID WASTE MANAGEMENT SYSTEM IN PRADHIKARAN

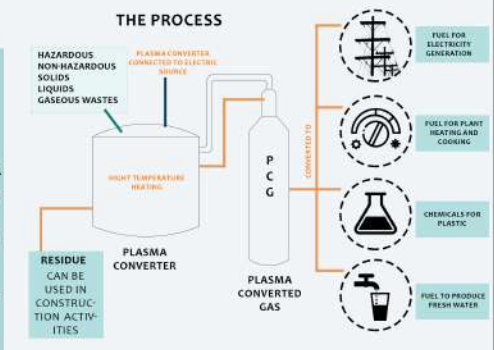


PROPOSED SWM SYSTEM WITH TECHNOLOGICAL INCLUSION



PLASMA GASIFICATION

PLASMA GASIFICATION IS AN EXTREME THERMAL PROCESS USING PLASMA WHICH CONVERTS ORGANIC MATTER INTO SYNGAS WHICH IS PRIMARILY MADE OF HYDROGEN AND CARBON MONOXIDE.
GASIFICATION OCCURS IN THE ABSENCE OF OXYGEN. THUS, MOST OF THE CARBON STAYS BEHIND WITH OTHER CHEMICAL COMPOUNDS.
THE GREENHOUSE GASES EMITTED ARE FAR LESSER THAN THOSE RELEASED BY BURNING.
THE TOTAL VOLUME OF WASTE TO BE BURIED IN LANDFILLS TAKES SUBSTANTIALLY LESS SPACE.
IT CAN FORM AN INTEGRAL COMPONENT IN A SYSTEM TO ACHIEVE ZERO WASTE AND PRODUCE RENEWABLE FUELS.

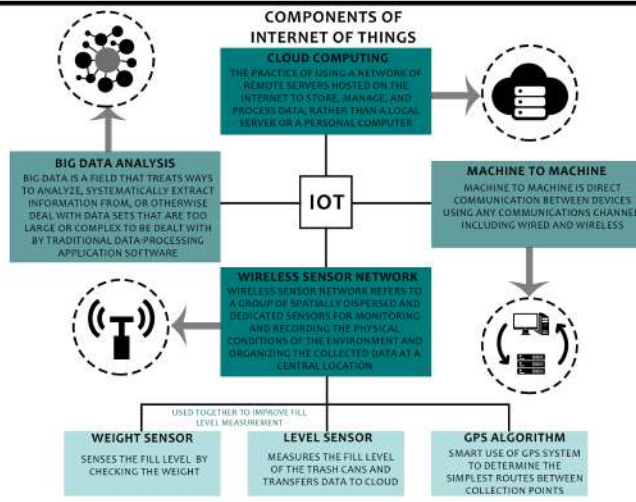


INTERNET OF THINGS (IOT)

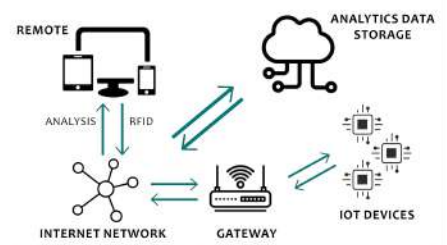
INTERNET OF THINGS IS A GLOBAL NETWORK OF PHYSICAL AND VIRTUAL DEVICES, EACH HAVING SEPARATE IDENTITIES OF THEIR OWN WHICH ARE CONNECTED THROUGH A VAST NETWORK TO SHARE DATA AND PROCESS IT INTO MEANINGFUL INFORMATION AND GENERATE MEANINGFUL RESULTS. THESE "THINGS" CAN BE MONITORED, CONTROLLED, UPDATED REMOTELY. IOT BASED APPLICATIONS ARE MADE AWARE OF THEIR ENVIRONMENT AND CAN CHANGE IN PARAMETERS OF THEIR SURROUNDINGS, THEY ARE SELF-ADAPTING.

USE OF IOT IN WASTE MANAGEMENT

SENSOR NETWORKS ARE ALREADY BEING USED IN SOME COUNTRIES. WEIGHT SENSORS AND LEVEL SENSORS AUTOMATICALLY NOTIFY THE CONCERNED BODIES WHEN THE TRASH CANS ARE AT FULL CAPACITY. THE DATA IS TRANSFERRED TO CLOUD. RFID TECHNOLOGY IS THE WIRELESS IDENTIFICATION SERVICE WHICH BINDS DEVICES WITH UNIQUE SERIAL NUMBERS ENCODED WITH A TAG. THESE CAN BE RECOGNIZED BY RFID READERS VIA RADIO FREQUENCY.



WORKING OF IOT



RFID TECHNOLOGY

RFID READER
RADIO FREQUENCY IDENTIFICATION IS THE WIRELESS IDENTIFICATION SERVICE WHICH IS USED TO BIND DEVICES WITH UNIQUE SERIAL NUMBER ENCODED WITH A TAG. RFID TAGS CAN BE RECOGNIZED USING RFID READERS EVEN WITHOUT DIRECT LINE OF SIGHT CONTACT.

ADVANTAGES

EXPANDED INTERNET CONNECTIVITY
PROVIDES A PLATFORM TO THE USERS TO ACCESS DEVICES REMOTELY AT TOUCH OF THE FINGERTIPS.

HIGH MOBILE ADOPTION
AS ADOPTION INCREASES, MORE AND MORE DEVICES CONNECT TO THE INTERNET OF THINGS, THUS THE NETWORK EXPANDS.

LOW COST SENSORS
DEVICES SUCH AS SENSORS ARE CONNECTED TO THE IOT, THUS INCREASING EFFICIENCY IN SENSOR READING.

WORKING OF IOT IN THE PROPOSED WASTE MANAGEMENT SYSTEM

WASTE FROM COMERCIAL PLACES IS COLLECTED IN THE SAME WAY. SENSORS DETECT THE FILL LEVEL OF THE CANS AND SEND THE DATA OVER CLOUD TO THE ANALYTICS DATA STORAGE.

INCINERATION OF INDUSTRIAL WASTE RELEASES A LOT OF TOXIC GASES INTO THE ATMOSPHERE. THEY NEED TO BE PROPERLY PROCESSED. WITH PLASMA GASIFICATION, IT IS POSSIBLE TO CONVERT THIS HAZARDOUS WASTE TO ENERGY AND USE THE RESIDUE LEFT FROM IT IN CONSTRUCTION.

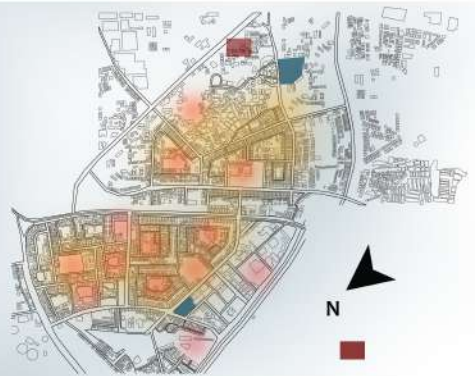
SENSORS FOR TRASHCANS IN THE PUBLIC SPACES, PROPER MESSAGES TO THE PUBLIC TO DISPOSE THEIR WASTE RESPONSIBLY CAN BEDONE THROUGH THE INTERNET OF THINGS.

APPLY 3R'S AND SEHHRGATE THE WASTE AT HOUSEHOLD LEVEL ITSELF AND COLLECT AT A COMMON POINT. SEGREGATE WASTE THROUGH COLOR CODING, SENSORS THAT ALERT RESPECTIVE AUTHORITIES AND PUBLICALLY AVAILABLE DATA THROUGH CLOUD CAN GIVE ADDED BENEFITS.

TRANSPORT OF THE WASTE NEEDS TO BE DONE EFFICIENTLY AS A LOT OF MONEY IS SPENT ON THIS PART OF SWM. SMART GPS ALGORITHMS CAN BE USED TO REDIRECT THE VEHICLES TO THE SHORTEST AND THE MOST CONVENIENT ROUTE SPONTANEOUSLY.

TRASH COLLECTION PROCESS IS ORGANIZED IN EWS HOUSING AREA. DUE TO THE HIGH POPULATION, MORE NUMBER OF TRASH CANS ARE REQUIRED. TRUCKS WITH SMART SYSTEMS THAT FOLLOW THE SMART GPS ALGORITHM ARE USED.

SEA AND RIVER SIDE WASTE CAN BE TAKEN TO THE TRANSITION ZONE.



- LEGENDS**
- HOUSING
 - PUBLIC SPACES
 - TRANSITION ZONES
 - EWS ZONE/ SLUM AREA
 - NEAREST RIVERFRONT

THE WORKING PROCESS

- SENSORS PLACED ON E-WASTE TO BE DISPOSED OF SEPARATELY DETECTED BY RFID SENSORS
- TRANSPORT TRUCKS CONNECTED THROUGH M2M WITH COMPUTER GENERATED SMART ROUTES TO SAVE TIME AND COST
- HOUSEHOLD BINS THAT ARE DIVIDED FOR DIFFERENT KINDS OF WASTE EACH WITH SEPARATE BAGS WHICH CAN BE SEALED CLOSE EASILY
- AT THE TRANSITION ZONES BIO-DEGRADABLE TRASH IS STORED IN LARGE TRUCKS WHICH WILL DETECT WHEN IT HAS REACHED ITS FILL CAPACITY AND MOVE OUT TO BIO-METHANE PLANTS

IMPACT ON DIFFERENT LEVELS

BUILDING LEVEL
PROPER SEGREGATION AND DISPOSAL OF WASTE. DIGITIZING THE PROCESS MAKES NECESSARY DATA AND STATISTICS ACCESSIBLE FOR EVERYONE. THE DATA WOULD BE HIGHLY ACCURATE WHICH SHOWS A VERY PRECISE OUTPUT THAT WILL GUIDE THE AUTHORITIES TO TAKE THE NECESSARY STEPS.

NEIGHBORHOOD LEVEL
PUBLIC SPACES BECOME MUCH CLEANER. THE MICROCLIMATE OF THE AREAS IS IMPROVED GREATLY. BETTER GROUND AND SURFACE WATER QUALITY. MAXIMUM EFFICIENCY IN THE WASTE SEGREGATION, EVERYTHING THAT CAN BE RECYCLED WILL BE RECYCLED AND REUSED WHICH MEANS THAT EVEN THE PRODUCTION COSTS WILL REDUCE OVER TIME.

CITY LEVEL
LANDFILLS AND THE WASTE GOING INTO LANDFILLS ARE SIGNIFICANTLY REDUCED. GREENHOUSE EFFECTS, RELEASE OF METHANE GAS INTO THE ATMOSPHERE, AIR POLLUTION AND TOXIC ENVIRONMENTS NEAR DUMPING SITES WILL GRADUALLY DROP. NATURAL FERTILIZERS PRODUCED THROUGH COMPOST AND BIOMETHANE PLANTS WILL IMPROVE THE OVERALL QUALITY OF THE CITYSCAPES, RELEASING MORE OXYGEN INTO THE AIR. THE WASTE MANAGEMENT SYSTEM AT CITY LEVEL IS IMPROVED TO A GREAT EXTENT.

EVERY CITIZEN BECOMES A PART OF THE SYSTEM AND THUS CONTRIBUTES TO A WELL STRUCTURED WASTE MANAGEMENT SYSTEM.

CLEANER AND LESS POLLUTED AIR DUE TO LOW AMOUNT OF METHANE AND OTHER TOXIC GASES IN THE AIR.

DUO TO THE INTERNET OF THINGS, THERE WILL BE A VIRTUAL MAP OF THE CITY, A "SHADOWY CITY" WHERE INFORMATION ON REAL TIME IS UPLOADED, ALLOWING LARGE SCALE AND COMPLEX ALGORITHMS TO WORK IN SYNC WITHOUT HAMPERING EACH OTHER AND PROVIDING ALTERNATIVE AND WORKABLE SOLUTIONS EASILY.

REWARD SYSTEM

REWARD SYSTEM HELPS IN CREATING A HEALTHY COMPETITION BETWEEN RESIDENTS IN THE NEIGHBORHOOD, ENCOURAGING THEM TO BE MORE RESPONSIBLE WITH THEIR WASTE DISPOSAL HABITS, THUS MAINTAINING THE FLOW OF A WELL STRUCTURED SOLID WASTE MANAGEMENT SYSTEM.

END GOAL

THE SOLUTION PROVIDED HELPS REDUCE THE WASTE GENERATED ON A SMALLER SCALE. WHILE SIMULTANEOUSLY THE WASTE FROM THE PRE-EXISTING LANDFILLS GOES UNDER PLASMA GASIFICATION PROCESS, THUS REDUCING THE WASTE ON THE OTHER END AS WELL.

THE TECHNOLOGY TO MAKE THIS HAPPEN ALREADY EXISTS, HOWEVER IT HAS NOT BEEN USED TO ITS FULL POTENTIAL.

THE DESIGN ALLOWS FOR THE MAXIMUM USE OF ALL THE TECHNOLOGICAL ADVANCEMENTS TO BE USED TOGETHER IN HARMONY, WHILE LEAVING ROOM FOR FUTURE ADVANCEMENTS. THUS, THE DESIGN WILL NOT BE RENDERED OLD IN A FEW YEARS BUT WILL IMPROVE WITH TIME.

CONCLUSION

A SOLUTION DOES EXIST THAT CAN HELP CATER THE PROBLEM POSED BY EVER-INCREASING WASTE. OUR DUTY IS TO LEAVE BEHIND A CLEANER EARTH FOR THE FUTURE THAN WHAT WAS LEFT TO US. CLEAN STREETS, A BETTER STANDARD OF LIVING, PLEASANT AND WELCOMING CITY SCAPES, DESPITE THE HUSTLE BUSTLE OF THE FAST PACED CITY LIFE IS POSSIBLE AND VERY MUCH WITHIN OUR REACH- IF ONLY WE WORK TOWARDS IT IN UNITY. OUR CITY'S WASTE IS OUR PROBLEM: WE ARE THE PROBLEM, BUT WE CAN BE A SOLUTION TOO. WORKING TOWARDS A GOAL THAT NULLIFIES THE EXISTING WASTE TO A MINISCULE AMOUNT IS A GOAL THAT WE ALL MUST WORK TOWARDS.