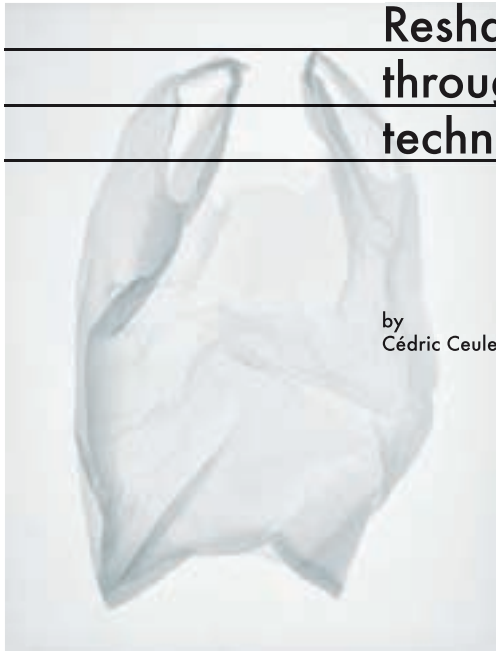


# The Plastificator

Reshaping waste  
through solar power  
technology



by  
Cédric Ceulemans



**«No-one made a greater mistake than the one who did nothing because he could do so little.»**

Edmund Burke



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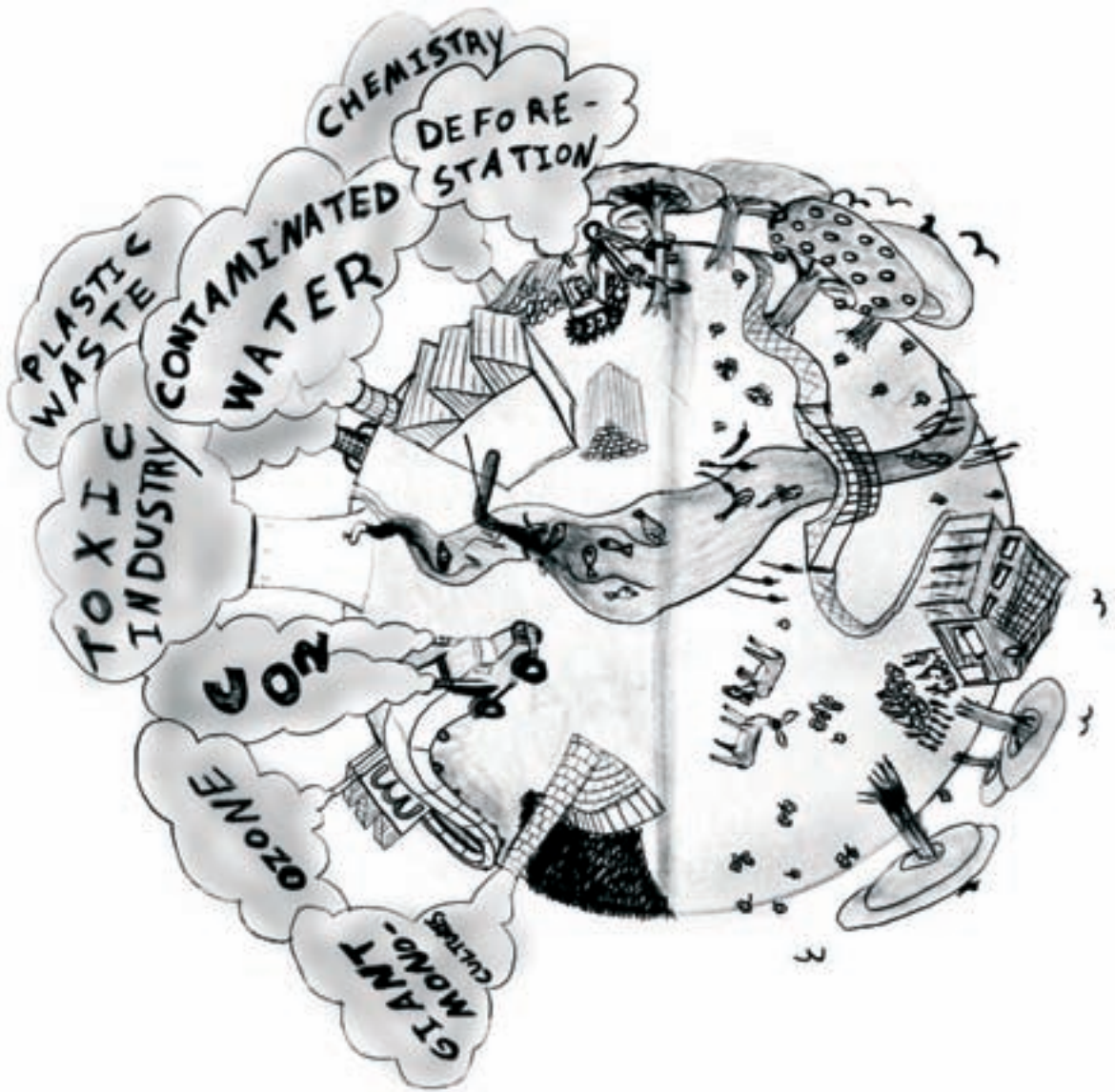
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# 1. Motivation/ Introduction

After a trip in Windhoek Namibia, where I experienced plastic waste, I decided to write a paper about the consequences of overconsumption, and about the possibilities of the waste resulting from this system. My intent is to create a viable system of reshaping waste for the benefit of communities in Windhoek. I want to promote Ecology in general through a wise use of the natural opportunities.

Throughout my research, I analysed a western society, building itself with energy and derived materials from cheap petrol. This capitalist system produces every item we use, from the irreplaceable to the disposable, often using this great material: PLASTIC. Can you imagine a world without plastic? It is the modern clay of every product, and was made at first to replace ivory, horn, rubber, cork, silk, etc. But it has unfortunately been misused and wasted, and because of its characteristics it remains in the environment for hundreds of years, without degrading. Its waste creates perpetual pollution for the environment and the different life forms on earth.

The message of the media influences most public opinion concerning the global state the planet is in. Communication and language need to be adapted, because the fear atmosphere

in which they wrap the news is not a solution, since it inhibits or misdirects action. We live in the century of communication, which gives us a great advantage to get answer to our questions. It is important to be critical about media communication and growth.

Our global environment and human situation finally bring us to that question: WHAT TO DO?

Well, first of all we should not surrender to the myth of the ultimate solution to many problems. Various projects and ideas help to change bit by bit. It is the work of thousands of NGOs, communities, associations, foundations and individuals to act toward a better environmental, social and material future; and it is also our personal responsibility as conscious citizens.

Therefore, I chose to work at a realistic utopia about revaluing waste products and using solar energy as a source of power. In a closed circle of recycling I tackle a possible self-sufficiency of a community in Windhoek, basing its resources on the harvest and recycling of plastic bags. Through a common project of community gardens, I want to raise awareness and find a solution to plastic bag pollution in Africa.

## 2. Picture of a western system

### Notion of progress

Growth is something established in our society. The ideology is evident for us but it appeared only in western countries and only 300 years ago with the English industrial revolution. Growth appears now like a cult of consumerism with its rituals. Like consumption: it has been the thrive and goal of our societies.

«Go back a few thousand years and the energy available to grow a crop or feed animals was limited by the daily sunlight falling onto the earth. But now we gorge ourselves with hundreds of years worth of sunlight every single year. Every part of modern life is now literally made of oil, from cd's and plastic bags, drugs and computers, from clothes and carpets to hair gel and cell phones. It is a fantastic useful substance! Then there is our food, each calorie we eat uses about 80 calories of oil to produce, package, refrigerate and transport. And fossil fuel produces fertilizers that now feed about 2 billion peoples who couldn't otherwise stay alive.»(The age of stupid)

Mankind is only 200 000 years old; 10 000 years ago agriculture was our first revolution and it remains the first activity on earth. Half of the total

population cultivates the ground, and 3/4 do it with their hands. So who are we talking about, « 20% of humans consuming 80% of the planet resources ». That's a fact, so not everyone on earth benefits from these refined technologies. There are 7 billion humans on earth and half of them live in the cities. They need to receive food and goods from farms and industries from outside the cities, as it's not produced in the cities.

Dubai, as a city, is the new symbol of the super power of money and energy. After drawing islands into the sea and building a ski slope in the desert, they are now building the biggest tower on earth. Dubai shows just one extreme example of what happens in every big human city; **they lose touch with reality**. I believe the loss of nature in cities (and I'm speaking about real nature, not just a few trees in the middle of an asphalt square) causes humans a loss of reality, indeed they hide the consequences of their lifestyle far away outside the clean city. Over-consumption causes too much trash, which requires a lot of energy to recycle (when it gets recycled).

The amount of trashes produced by the big capitalist metropolises are carried (if lucky) outside the "walls" of the city

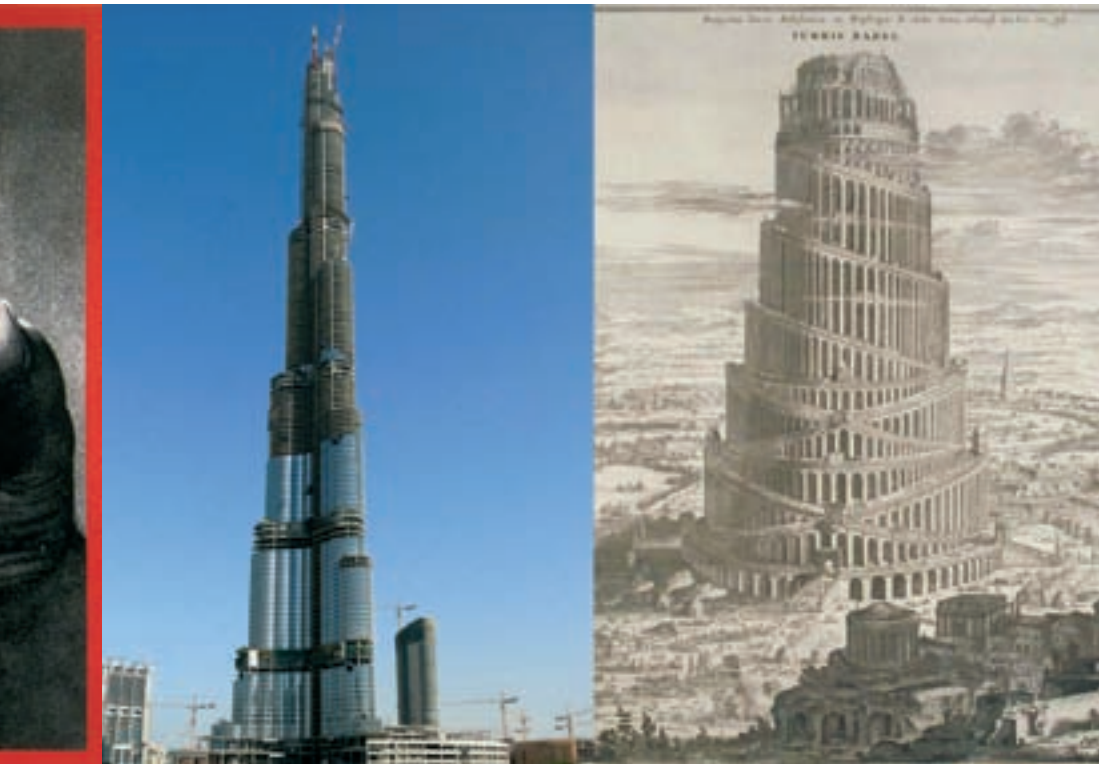


to be “recycled”. And most of it is not recycled because of the complexity of the materials used in the products. Regarding plastics, only the same type of plastics can be recycled together. It is estimated that only 7% of the total plastic waste are recycled. The rest is unloaded in a dump or incinerated and both cases have a serious environmental impact.

When analysing history, the collapse of the society of the Easter Island (due to over-use of the limited resources) teaches us like the science of population dynamics does, that the living is in close relation with its limited environment. Economic society thinks that growth is beyond limits. It is this notion of non-limit that causes a problem in a limited world. Global growth is also linked to the growth of pollution, toxic industries, diseases, etc. Ecology will have to overtake economy in this fake system of infinite growth. In the 19th century “gross national production” was invented to quantify the level of happiness. Conclusion : consume more to be happy!



BARBARA KRUGER  
*I Shop therefore I am*, 1987,  
 Photographic silkscreen on vinyl,  
 111 x 113 inches







## Colonial influence in Africa

### A problem becoming global

As large international corporations take control of African market they create needs for products and concepts and slowly change the life style of people. This is basically valid for every developing country toward a capitalist system allowing participation of foreign competitors. I'm going to take the example of plastic bags because of its global presence. It's been only 20 years since plastic bags were commonly used in the continent, and it has been such a great success that today volatile plastic waste are everywhere in the environment. Indeed, inhabitants of Somali land are so used to see these bags in trees and bushes, they call them «flowers of Hargeisa» after the name of their capital. This is a consequence of a change of mentality that occurred fast, women swap their traditional woven baskets for the free and disposable plastic bags. If we realised these bags and all disposable plastic objects were actually more hurting than helping, it's because of the experience we had with them. History taught us that we learn from our mistakes and there are very few chances to prevent the same mistake from happening in other places. We all have to

pass through the experience to understand it and eventually adapt to it.

The same goes for ecology, our developed countries are slowly «waking up» about the global situation of the environment and the harms it could cause to the living. In Africa it's apparently complicated to create a viable ecologic progress, because they don't see the relevance of using alternative energies (for example) if the one they're using is giving out what they want. The problem is that they use our pre-made model and start this until they face a close run out, or experience some efficient alternatives. For example in Windhoek Namibia lots of houses are being equipped with solar system for hot water on their roofs. Because some people started using them, then others joined and made the prices go down. But in general, solar power projects are often rejected.

The social acceptance of projects or new concepts generally in the African continent, depends on different aspects. The need of direct benefit, the communication of the project, involvement from local people, appropriate design in terms of efficiency, aesthetic, security, replicability. Good management and planning of the project team are also needed.



THE PLASTIFICATOR



PICTURE OF A WESTERN SYSTEM





On top of all, a deep documentation about geography, anthropology, politics, etc. Few solar projects failed because of social acceptance, they were not appropriate regarding the traditions, were stolen or simply were not efficient enough. Western entrepreneurs have this dream to see solar technology working in Africa. It is therefore important to define an appropriate technology.

The influence of the western colonialism brought good and bad, but it definitely altered many things. Long ago, colonial powers forced local populations to embrace their ideology and culture, and today most African countries are developing their economy based on that model. To give an example, Catholics were shocked by the spiritual beliefs of the natives and felt committed to start a quest of converting lost souls. The pretension of the western countries to educate the world literally killed lots of populations and along with them, traditions and cultures. But it's essential to focus on the future, because what's important is not what we lost, but what's left to be protected, and what can be created.

# 3. Plastic waste pollution

Humans learned how to get pure condensed energy out of their environment, 80% of this energy used on earth comes from fossil fuels. It is used to power factories which are making your car, your TV, producing your food, your books, your furniture. It is also used to power your house, your computer and to light your bulbs. In this energy you find a certain amount of petrol to create all the disposable objects you use every day, another big amount to ship all these cheap products, and a little more to make the billions of plastic bags in which you put them.

Plastic bags are so cheap to produce, sturdy, plentiful, easy to carry and store. For those reasons, they have captured at least 80 percent of the grocery and convenience store market since they were introduced a quarter century ago, according to the American Plastics Council. Between 500 billion and a trillion plastic bags are consumed worldwide each year. But like candy wrappers, chewing gum, cigarette butts, and thousands of other pieces of junk, millions of the plastic bags end up as litter.

The energy and resources used in producing plastic bags are also an issue. They are made from ethylene gas,



derived from non-renewable natural gas or crude oil using water, energy, and refrigeration.

The average useful time of a plastic bag is 20 min. Then, it becomes disposable and therefore most of the time trashed. Once in the environment, it can take about 400 years for plastic bags to breakdown. As they decompose, tiny toxic bits seep into soils, lakes, rivers, and the oceans; eventually making their way back in our bodies.

Our ecosystem has no borders, and the effects of our lifestyles are visible. **Plastic is nowadays a blessing for mankind and a curse for all life forms; which we are also part of.** Bits of plastic are found in the garbage patch (driven by marine currents) of the oceans at a density 7 times higher than plankton, as of now no organism can degrade plastic. Animals are eating it, and we're eating some of these animals.

Fortunately some countries are adopting restrictions or banning the thin Polyethylene bags. Kinshasa as some cities and countries like South Africa, Tanzania, Botswana, Egypt, Somalia, Rwanda, banned plastic bags production. Kinshasa produces 1000 tons of plastic waste every day.

They cover the ground and get buried after time thus creating a waterproof layer. They block the sewage system, causing overflow in the rivers where diseases appear. The banning program acts like a wind of change, many other countries and cities around the world are ratifying the project.

From a consumer aspect it is also important to realise the amount of disposable plastic used in your every day life. Only a few years ago we managed to sustain ourselves without any plastic packaging, we used reusable glass jar and bottle, wooden box, and ceramic containers. What used to be sustainable and ecologic has been replaced by disposable plastic. By what we choose to buy we have an impact, it is affecting the decisions of industries. Plastic is an incredibly useful substance, which shouldn't be wasted.



ANDREAS GURSKY  
*99 Cent*, 1999,  
chromogenic color print,  
207 × 337 cm



# 4. Time for (re)action

Many other problems on earth push us to think : WHAT TO DO?  
The problems we face are the results of our own making, and since we created the problem we can also solve it. You should leave the world a better place than you found it and you shouldn't take more than you give.

« If slowing down helps us turn around, then it is a legitimate part of the strategy » (William Mc Donough writer of « Cradle to Cradle »)

There are no ultimate solutions, there are a million different ones, from small involvement like conscious consumerism, to devoted politicians, citizens ,NGOs and project teams. "Everyday solvers" are working for justice, peace, environment, etc. They give us the hope we all need.

The overall message of the media about human influence on earth is tinted with catastrophic warning and fear. I personally think the message is wrong and scaring people is not a solution. It inhibits or misconducts reaction. We should constantly improve our knowledge and look for information, to fully understand the situation because of it's complexity. It's only when you create your own point of view that you can become confident about your

actions. Otherwise you just act like what public opinion tells you to do, and buy BIO and ECO and GREEN because it is « good ». And I don't mean to deny the work of organisations acting for equity. But the entire good or bad situation about that subject is designed for you not to worry any-more and so you still may consume.

I'm not fully ecologic either, I participate in the mass consumption and I live in a city, I have a car and I also sometimes use plastic bags. But the point I'm trying to make is that it's fine to be who we are. We have the chance to benefit from wonderful opportunities life's offering us to be happier. Because life is too short to be scared and too beautiful to be wasted. We just have to open our eyes to the world to understand its process, from the overall world ecosystem to the smaller systems we participate in every day. We can get involved and contribute to the society or to the world by making choices we think are good. For some it may be to use a textile grocery bag not to contribute to plastic bag pollution, and for others it can be a politic quest to ban the same bags from their town or country. Everything is up to you. Then you can choose what to do, if you want to.



«(...)Designed for you not to worry anymore  
and so you still may consume.»

## What is being done?

Two extreme groups of people are trying to have an impact on this World, from **utopian thinkers** to **realistic solvers**. They both try to act for the best.

The Cradle to Cradle book is a good example of a **utopian vision of the world**. Written by William McDonough and Michael Braungart, it is becoming a growing influence on the design world.

« Reduce, re-use, recycle » These are the central words of the concept. It is a vision of the industrial world, re-using over and over again its resources.

« Waste equals food » the principle is simple it is based on mimicry of natural systems.

When something finishes its life it becomes « biological nutrient » for other life forms. He compares it to industry and speaks about « technical nutrients » that circulate within a closed loop system without being « down cycled » into low grade use ( as most « recyclables » now are).

Although it results in a utopian system, the unified philosophy of the book is changing the design of the world by its influence on people's decisions.

**Realistic solvers** are people who are in the field acting for change. They get their hands dirty to « clean up the world »!

« Clean up the world » is an organisation working as a web based platform for NGOs and communities. Organisations from all over the world use this platform as a meeting point to exchange ideas and eventually create projects and happenings.

Evans Githinji is an entrepreneur in Nairobi Kenya, recycling plastic bags into hard fencing poles. Employees are collecting the bags everywhere. His business is running great.

Tie Tek in Texas is turning used plastic materials into rail road ties. It is a fruitful business and since every rail road tie on earth has the same size, they could sell them worldwide. They last longer than the wooden ones, and can be recycled again and again.

The « zonne oven » from Rick Claassen and Anna Brons is one example of what can be done with solar power and plastic melting; they produce shoes for local communities in Kenya.

The NGO « Qui dit mieux? » in Benin collects, cleans and recycles plastic bags. They knit stripes of bags to



create hand bags, clothing and art objects.  
 Toni de Roover, a Dutch designer and artist turns plastic bags into aesthetic bricks for his « wall » project. Engineers without borders (Brussels) have an entire plastic recycling policy in developing countries. They work in Kinshasa, Ouagadougou, Kigali and Lubumbashi. They create a collect and treatment program to sell plastic particles as raw material to industries and when the plastics are too dirty, they heat it up and mix it with sand to make pavements.

All these great examples are working on big or small scale and are representative of a change in the mentality. They try to raise awareness and act for a change and use plastic waste as an appropriate raw material for what they're doing. They create one opportunity for entrepreneurs to transform an environmental problem into an income. I want to add my brick to the wall, using plastic bags to create fine objects in order to up-cycle (in opposition to re-cycle or down-cycle) this wasted material.

« Never doubt that a thought full group of committed citizens can change the world, indeed it is the only thing that ever has » Margaret Mead





**SMALL ACTIONS**  
**x LOTS OF PEOPLE**  
**= BIG CHANGE**



# 5. What I chose to do

I chose to work on a realistic utopia about waste. It is utopian because of the high goal of every action in the project, however, all of them are workable to a certain extent which makes them realistic. I want to create a system where I give value to trash thanks to solar power technology to make objects to obtain self-sufficiency while promoting the use of the sun. I found out that polyethylene plastic bags can be fused together with the condense rays of the sun creating a hard waterproof new material. I use this process to create objects helping inhabitants of a township grow and implement community gardens. This implies a community to run the project to take care of the different aspects of it.

## The circle of recycle

The recycling matter is (as Cradle to cradle expresses it) re-using waste as a raw material. In that sense it is more a process from "grave to cradle", as the raw materials are trashed plastic bags. They are collected in the environment as something valuable; this changes the point of view from cleaning to harvesting. The recycle program works along the plastic bags consumption, and is dependent on it. The act of purifying the environment is temporary; it is a positive reaction toward a system

promoting consumption as The path to happiness. Reusing what the society rejects is a way to state the uselessness of such a program.

"The ones preaching growth of consumption, in countries where basic needs are more than satisfied, are as harmful as drug dealers spreading their dope." (Albert Jacquard)

The anti-consumerism expressed by Karl Marx, is inspired by Thorstein Veblen and his book, *The Theory of the Leisure Class*. It expresses an extreme (but inspiring) concept of consumerism starting at a very early age. I believe consuming is a joy of life, unfortunately it's the other extreme (as we know it), over-consumerism, which has become our everyday.

It is capital to understand the essence of happiness. Subsistence, Protection, Affection, Understanding, Participation, Leisure, Creation, Identity, Freedom (from Manfred Max-Neef) and I would add Love and Transcendence. The goal in life is to be happy and to prosper. There are a lot of different path leading to this goal, but it has been proved that people living in material abundance are not especially happier.



“Economy must give way to ecology”  
(Albert Jacquard)

An everyday recycle attitude involves the use and reuse of resources. It must be the core action of the self-sufficient life of the community and act on different levels within the community. Finding another use for things you would trash starts a circle of recycle, where waste becomes a raw material.

Self-sufficiency in that case is a goal that doesn't separate the community from the outside world; it allows people to find an alternative to a waste system. It is an independence act, and every member participates to a common goal. The interdependence of the members in the community will bring the exchange of knowledge and give everyone an important role.







## Recycling plastic bags

The bags will be collected by members of the community first of all in the environment, later, other sources of harvest can be found. Once collected, they are rinsed, dried, then placed in the moulds of the solar machine to produce different objects:

### **Rain gutter:**

Made to fit any type of roofs it collects the rain falling on the roof to store it in a container or refill the underground aquifers. The water collected is used by the community and the garden.

### **Bucket and seed box:**

The buckets will be produced for the gardening project, the molds can be adapted to fit different sizes of containers. So the seed boxes represent a value, a good genetic material to grow healthy crops.

### **Wings for wind mill:**

The mills will work to power electricity and mechanical machines during the day while pumping out fresh water out of the ground.

### **Plain plastic sheets :**

The sheets can be used by crafter to create objects for sale to make money for the community

Added to these objects produced by the solar machine, extra concepts are added to the community to accentuate the self-sufficiency of it.

### **Composting and worm composting:**

It makes rich ground for the garden project and helps low down the producing of garbage. Worm composting produces a natural liquid fertilizer for a better growing of the plants. An option would be that the compost is producing biogas to sustain the energy expenses of the community as lightening at night or cooking at night.

### **Water recycling:**

The water used is being recycled by a filter system and used for different means.

For example water of the shower can be used for cleaning bags, and watering crops. The steam of the cooking can be collected to wash hands.

### **Solar cooking:**

The sun can be used to cook during the day, and different type of solar cookers will be one example for the locals.

### **Useful garden:**

The garden produces the herbs and fruits necessary to the community but it also produces the plant which makes the natural releasing oil for the plastic moulds.



### **Dry latrines:**

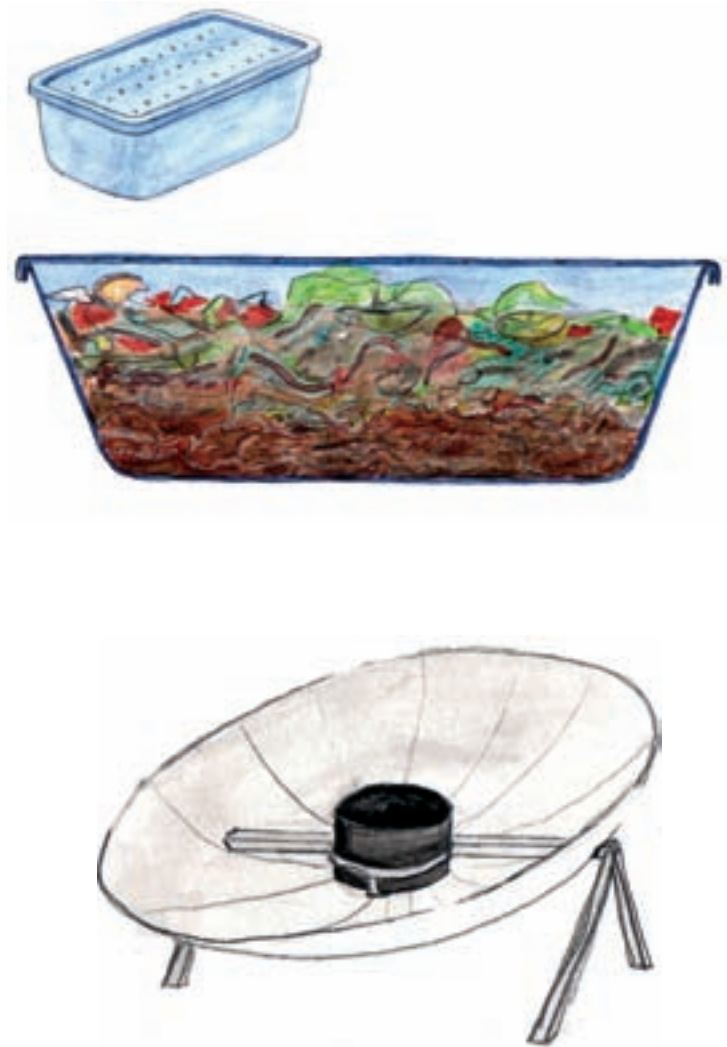
These latrines are separating stools from urine and don't produce smell. The urine infiltrates the ground, and the stools dry in the sun and can be used as fertilizer or charcoal.

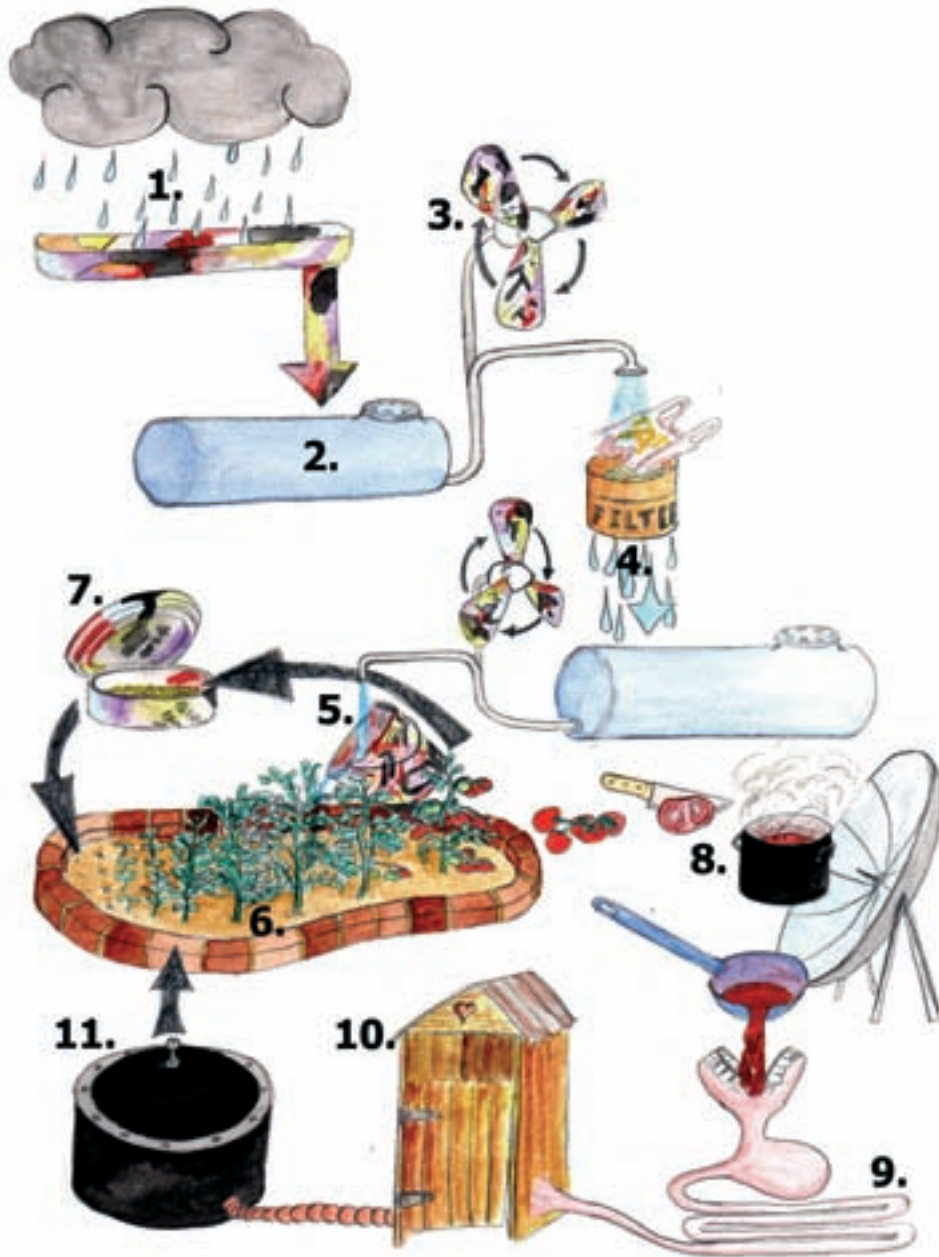
Other concepts can/will be added later to the program

All these systems will function for the benefit of the community, but also will act as a contagious example of opportunities. Knowledge transmission is another goal of my design, therefore it needs to be simple and efficient. Training will be organised, but in this case I will be the coordinator of the project. I am working for people that do not fit in the capitalism dream, but are dependent on it (townships of the big cities). Most people in the rural areas get a wiser connection to nature, they build their houses with clay and branches, they collect their crop and have sheep or goats. But in the townships they are disconnected with this reality, as we are but the system does not take them into consideration. As the city grows, they are pushed further out by bulldozers that often flatten all what they had.











The rain collected by the gutters (1.) is stored (2.) to prevent evaporation. Then the windmills pump the water (3.) to clean the plastic bags. This water is filtered (4.) to be reused. The buckets (5.) transport the water to the garden (6.) and when the crops are mature, the seeds are collected in the seed boxes (7.) for the next season. The food is prepared on the solar cookers (8.). Once the food is digested (9.), latrines system (10.) to separate stools from urine. The biogaz digester (11.) collects the faeces and turns it into compost for the garden, and energy for the community.

## 6. Penduka case study

I decided to realise my project in Windhoek Namibia because of a trip organised by the academy in November 2009 with a few students of the Man & Humanity department and Erna Beumeurs. This trip was the realisation part of our "system project" of the last trimester of the academic year 2008-2009. The goal of the project was to collaborate with Penduka, a Namibian organization, to understand the bigger picture and adapt our individual projects to a more systematic point of view. **My final project is the achievement of this system project.**

Penduka train and support women throughout the country to take charge of their future. « Penduka » means « wake up » in Oshiwambo, it represent the will to empower their life.

Penduka runs a shop on the site of the organisation, where are sold the production of the different workshops. The village embroidery works with women from Katatura and from the country side. Each of the piece they do is composed like a story, and every women has her own style. They get paid for each piece they produce. In the glass beads workshop three women with hearing impairments crush bottles, melt the glass to shape glass beads. Necklaces and bracelets are then made with

the glass beads. There is also a Batik workshop where employees give their imagination free rein when designing mainly pillows and tablecloth. A ceramic workshop produce for the shop but also for the kitchen. In the kitchen the women prepare meals for the tourists and hosts of the hospitality department. They also cook everyday for the TB (Tuberculosis) patients of the DOTS points all over Windhoek.

The DOTS (direct observed treatment) programme for TB patients is another arm of Penduka. They provide 527 people with a healthy, hot meal per day. Health workers then ensure that the patients take their medication.

There are five vegetable gardens tended by TB patients. Fresh vegetables from these gardens are used to feed the patients. There are 13 DOT points all over Katatura and the programme has a success rate of 83 per cent. TB patients also do bead work and wire-art at the DOT points, which are sold in the shop of the organisation.

Each of them works separately but is an essential parts of the organisation, which in some sense, runs like a community as a whole.





## System project research

For the “system project” Penduka was our starting point. I began my research with an extensive topographic analysis of the region surrounding Penduka using Google Maps. I first discovered that Penduka was in front of the water. The Goreangab dam used to be the reservoir for the “Namwater” general delivery in Windhoek. You can see the treatment plant on the east side of the dam.

Close to Penduka; Katatura is a Township of Windhoek. Some inhabitants of the informal settlements don't have toilets, so they go in the hills around the dam and it flows into the Goreangab when it rains. The photos of the water point on Google earth are marked as “contaminated lake”. But no laboratory accepted to analyze the water. It is at a lower level than the city so it becomes the sewer of Windhoek whenever it rains, this is because the rain drips on the ground instead of infiltrating the underground aquifers.

Namibia is mainly a desert country where water is a sensible point. Most of the water used for the everyday use comes from the boreholes drilled in the prehistoric underground aquifers, mainly by the governmental (and only)

water industry in Namibia (Namwater). Some of the big rivers of the country do not reach the sea any more. The lands get desert also because of wind and temperatures.

The majority of Namibians live in rural areas and exist on a subsistence way of live. About half of the population depends on agriculture for its livelihood, and if you compare incomes of the entire country, there is a huge inequality which shows that a large group of people do not rely on the formal economy for their survival. In the black township of Katatura, people live in houses made of everything they can find, obviously they are aside the traditional economic system, but they still have to pay for food and water.

In desert areas it is difficult to cultivate a garden, the hot wind dries the crops, and during 5 month in the year it rains less than 20 mm in total. If the rain of the year is saved it would be enough to grow a garden. I calculated that a roof of 4m on 4m, in ideally conditions, collects 5864 L a year because the average amount of rain fall during the year is 364mm. But this is without calculating the evaporation index and the irregularities of the material used. Even If you take away the third of that amount, it is still around 12L per day

that you can use to water crops. It is possible to join different houses together, and start a community garden.

Community gardens are efficient to grow a bit of everything. Only a few devoted people (3-4) would be responsible of it. It will benefit the whole community and from time to time trainings for children will be organised to sensitize the young minds to gardening. In the end the harvest could be consumed by the community and some may be sold or exchange to get material for the garden.

### Experience of the field

I want to bring awareness about ecology by improving the quality of life (idea from Jane Goodall). People living in misery will have a poor desire to act for the environment, they first have to fulfil basic needs. And as Maslow's pyramid shows, if the bottom of the pyramid is weak, the self-actualisation, which problem solving is a part of, can not be! To help people live a better life I chose to produce objects in direction of self sufficiency, and show them the actual benefits of using the sun power.

Previous solar cooking ovens projects failed in Windhoek, for different

reasons. First of all, the men were against it because normally whilst the women would fetch the wood and cook dinner, they could have their privileged moments between men. But because the women didn't have to find any more wood they stayed with the man and therefore they rejected the project. It was also because it took too long to cook (unsuitable oven) and people would steal the food while they were not watching.

These previous failures were an eye-opener to the importance of field work and social acceptance of any project abroad. It was too often the case with people developing projects without field preparation and also leaving the project with no-one to take over. There is also this example of a doctor building a hospital in Bolivia. When the building opened, no one came! It took him some time to realise that people didn't come because of the name "hospital" which for them signified "death". It's only when he painted health care centre in front of the building that they started to come. The social acceptance of a project is something to be considered expansively to succeed.





MASLOW'S PYRAMID OF NEEDS

## Plastics in Windhoek

“Plastic Packaging” is a Namibian company which is the only national manufacturer of plastic bags and sheeting. In addition, it trades in and distributes various other packaging products throughout Namibia, South Africa and Angola. It also owns a plastics recycling plant in Okahandja. Apart from this national industry a lot of products are imported, from South Africa mainly.

A friend and I went for a 30 min. walk around Penduka, and we came back with a big jute bag filled up with plastic bags and packaging. There is definitely a lot of plastic waste in Windhoek, and wild dumps is a problem to be solved. Initiatives are there to recycle waste in Windhoek, recycling stations on parking plots of shopping centres are apparently emptied every day. Unfortunately the recycling attitude is obviously not general.



DUMP IN WINDHOEK



# 7. Solar Machine

I knew it before but when we arrived in Namibia, the sun heating up our cold "dutchified" bodies made it so evident to use it as a source of power. The Namibian sun is incredibly hot because of the very few clouds. The sky is almost deep blue all the time, and the temperature sometimes goes above 40 degrees which are the best conditions to use solar ovens. On a recycle aspect my machine will work as a purifier. When there will be no more plastic waste, the machine will adapt its function. It can be divided into sections and can be used individually for various purposes, as cooking, sterilising water, recycling the used recycled objects.

**Sun power is the best technique to melt plastic**, because it needs a constant and diffuse heat to properly melt the plastic bags. Otherwise the plastics melt from certain areas and the fuse is not homogeneous. The solar machine uses the direct energy from the sun. An average temperature of 120°C is enough to melt the bags and get the sufficient softness to fuse them together. Above this temperature the bags would oxidise (burn) and the smoke of this reaction can be dangerous.

## Solar oven research

The sun offers us every day (maybe not every day in The Netherlands) an incredible amount of energy. 10 550 Exajoules are absorbed by the earth surface every day. One Exajoule is about the energy released by 1 700 000 Hiroshima bombs. One day of sun on earth is more than enough energy to power whole humanity during a year. Our earth ecosystem is using it, sun radiations powers the cycle of water. The sun literally powers life on earth.

Throughout my research on the subject I saw many different types and designs of solar ovens from low to high technologies. Solar systems are nowadays producing electricity, heating water, regulating the temperature of building constructions, it powers a whole variety of experimental projects around the world and I have no doubts that solar power will be the energy source of our future.





## Development of the machine

The solar machine can be realised in different materials, according to the availability and the average weather situation of the field. I isolated three possibilities: **metal, wood, scraps**.

I decided to realise in Eindhoven, a scale prototype in wood, to visualise the concept and to “understand while building” some of the practical aspects of the challenge ahead. In this prototype I use pine wood, and this type of wood don’t grow in Namibia. Wood in general is a living material which moves with humidity, it is not the best material for a solar oven. I used it because it’s a material I like and I can work quite fast.

For the Namibian context, metal seems to be a good compromise, because of the mines all over the country, and because craftsman are skilled welders in Windhoek. Metal does not alter that easily with the weather. I think for my next prototype I will use Aluminium elements for the structure, because of the light weight and because it does not oxidise.

The general elements of the machine are:

- **curved reflective material** focuses the rays on one area under the oven. The whole reflector is separable in pieces to be stored to protect them from sand, rain, wind, stealing, etc.
- **a fixed pole** around which the machine turns.
- **hinge on two axis** allows a good sun track.
- **the oven** is the metal and glass box which collects the rays of the sun and builds on the heat. It is a detachable element.
- **the different moulds** are placed in the oven. They are the elements in which plastic bags are accumulated to be shaped into finished products.

I decided to build a curved mirror to collect the rays of the sun because of the efficiency and the accuracy of the technique. Through my researches I also had a meeting with Rick Claassens, who build the “zonne oven” project. He advised me to go on with this design.

The track of the sun is an important aspect, and is manual in this scenario. To help the user to centre the machine with the sun (to get the optimum amount of isolation), I added on top of the handle a sort of sun dial.



This is because the handle represent the ideal axis for the rays of the sun onto the oven.

The mould absorb the heat of the concentrated rays of the sun from the under part of the oven. That's why the oven will be composed of two glass parts, above (lid) and under (bottom) the oven, to let the rays pass trough without loosing the heat. The hight of the oven will be adjustable to get the right temperature.

There is a different mould for each different objects. The inside part of the moulds will be manufactured with stainless steel to minimise the sticking of the plastic when melted. To release the plastic objects from the mould a natural releaser will be used, and as mentioned earlier the plant producing the oil will grow in the community gardens.

EXPERIMENT N°4





EXPERIMENT N°5



# 8. Conclusion

The world we're living in, is the result of the previous centuries of evolution behind us. What it use to be is the past, and however it sometimes seems better than the present, in some senses, we shouldn't go backward. This world is nowadays in a fast motion of change. Everything is still possible.

Plastic waste pollution is only a very tiny part of the different problems of our Society as a whole. It gets very complex when we analyse the interdependence of all these problems. I think there is no unique solution to the problem, the solution is to act on different level where everyone is important. It gives us a chance to act on a more responsible basis acknowledging that there are reactions to our actions. A whole variety of people running associations and NGO's gives us great examples, and I decided to act along with them.

Still, a lot needs to be accomplished, and solar technology will also develop with time. Instead of digging the ground, searching for energy, some engineers are developing the future. Look around, every natural system and element is powered by the sun, it is a huge nuclear plant with a life time of 8 billions of year. I will use it and promote it.

Recently Christien Roos (Co-founder of Penduka) expressed me the will to start an Eco-village program at Penduka, to promote alternative ways to cook, garden, power your house, recycle your water and waste, etc. For now Namibia is my goal, and maybe later I'll have the opportunity to start a new program somewhere else. Working in collaboration with local entrepreneurs, and people from various backgrounds will open my perspectives and enrich the program.

It would have never been my choice to work in Africa if I didn't go there, as I do not especially approve plane travelling. But now that I'm back, it seems that there is something more out there. There's hope.

**«A world of sharing must replace the sharing of the world.»**

Claude Lelouch





"You have to go for the love of chance."

A. Sirtoto.

Welcome on board!

# Inspiration/ References

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# Appendix

## A straight line

I studied Sculpture in Brussels and Helsinki before attending the master program "Man & Humanity" of the Design Academy. During my studies I have been following a straight "line of ideas". From the idea that nothing lasts forever to this self sufficiency aspect. Let me explain.

## ECO-1

I created this installation during my last year of sculpture, it was about observing human behaviour towards a changing world. The coming scenario of our so called "developed" societies was so bad and complex that I decided to start over a new world called « lucky planet » (because of the clovers that were growing on it). This planet would be launched from earth and become a satellite like the moon, so it could witness the earth decline.

To create my planet I needed to invent an ecosystem, and our planet seemed to be a nice example for a start. Therefore I made an experiment of a self sufficient ecosystem called ECO-1.

The structure worked on a system of water circle and energy exchange. It was more based on my para-science knowledge than tangible sciences. The water evaporated under the structure, to condense into drops in a big plastic cloud above. And as it rained on the structure it was directed in a sort of pool where bacteria's and small organisms started to appear. When the pool was overflowing the water was filtered through sand and plants into gutters to the bottom of the circle to be evaporated again.



I tried different lightning circles to experiment vegetable life adaptation. I planted clover, grass and watercress, and was very surprised to see other sorts of plants growing on it. Mushrooms started to take over certain areas of the structure, they were red, blue, white and brown, ... Then insects appeared out of nowhere, small flies, and shortly after, spider knitted their webs on ECO-1. Balance appeared, slowly everything was stabilising. Plants that couldn't be in certain places too moist for them, died and others species started taking over.

I was very pleased with the experiment but as I said earlier, nothing lasts forever, and I disassembled the installation and recycled every part of it. This notion also grew out of this pretension that most artists have; lasting forever. Art tells us something about ideas in the air at that particular moment. It should be an inspiration, and disappear to give way to new ideas. Human mind is always adapting and evolving, therefore projects should evolve and grow. Projects are more alive when they have a certain life span.



## THE CUP PROJECT

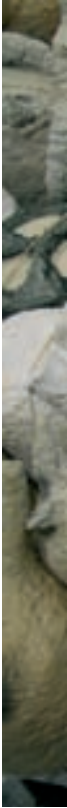
I started the academic year 2009 with the conviction to change the world into a wise living human society. I wanted to propose a global utopia for a better world. I quickly realised that it was naïve. Inviting people to change would include people that don't want to change, and forcing them is a form of extremism. I tried to suggest a change of lifestyle on a very small scale.

My research came across the problem of drinking in plastic cups. Beside the energy cost (subject of debate between paper cups, plastic cups and ceramic ones) the health aspect is catastrophic, when you heat this sort of plastic (type 6) styrene leaches out of it and adding to the risk of cancer it causes hormonal disturbance causing among others low sperm production. This type of plastic cups are also not recycled and therefore incinerated when not left as litter in a landfill.

I started to put information on the coffee machine of the master space at the design Academy to aware people and push them to use ceramic cups, and witnessed a surprising reaction. Nearly everybody continued to drink out of plastic! Because it is simpler to push on the button than to actually clean a cup. I saw a straight analogy with our societies and the way we act toward the

world and the environment. A majority of us simply push the button because it is easier, it saves time. But we ignore the costs of such a mentality; society manages to hide it from the consumer. My reaction was to make for everyone of the master space a ceramic cup and to personalise it, so that they would drink in a safe and sustainable cup! The raw clay cup was offered in a personalised recycled "papier maché" box (made out of the paper waste of the master space). They could also find a seed patch of mint that they could plant to drink a mint infusion in your future cup. Each cup was numbered for statistics. My intention was to promote respect of the object throughout an interactive personalisation, and eventually influence the use of the plastic cup consumption of the master space. It is still in progress...

My ideas and ideals may not be new, but I try to refine them more and more without really knowing where I'm going. There is always a « chance factor » that plays a role in every project I have realised so far, and I do hope to continue being lucky.











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