

## **CLIMATE ENGINEERING**

### **The simplest technology of vapour flow re-alignment into utilitarian scope**

Poverty eradication from seasonal water production to drought resistant perennial distribution.

#### **Abstract from the East African example**

In man's current perception, East Africa is governed by bi-annual rainfall subjected to a flood and drought regime.

A field case from 1983, with annual rainfall of 230 mm in a region under a 600 mm isohyet, is a recorded drought period with devastating cattle mortality.

Fifty square kilometer land surface under 230 mm rainfall, received 11.5 million cubic meters of water. After 40% reduction for seepage and evaporation, 6.9 million m<sup>3</sup> would remain to cater for 945.000 head of cattle with an average daily consumption of 20 liters, for the entire year.

Grade A cattle requires seven square meters of consumable grass cover per day or 2555m<sup>2</sup> per annum. Fifty square kilometer of perennial grass cover under 230 mm bi-annual rainfall distribution should therefore suffice 39.000 head of grade A cattle.

In reality the area however, could not sustain eight thousand subsistence livestock units, including sheep and goats with a daily water demand far below twenty liters.

Thirtynine thousand head of grade A cattle consume 285.000 m<sup>3</sup> of water per annum, which leaves a water volume in excess of 6.6 million m<sup>3</sup> for wildlife in this case.

This remaining volume is sufficient to cater for 120.000 elephants with a daily demand of 150 liters for that same year.

However, wildlife was forced to migrate to adjacent national parks in an attempt to survive, subject to a lack of water and vegetation.

This 'drought' period re-fuelled the outcry to de-stock cattle populations, to boost commercial hunting and culling of wildlife on one side and leave nature to take its course on the other side. In other words, experienced cattle breeding should make way for subsistence, rain dependent agriculture, further commercial depletion of wildlife would finance its survival and the isolation of nature reserves would overcome a worldwide climatic flood and drought regime.

In the meantime, 6.9 billion liters of water had vanished in seasonal widening and deeper eroded discharge; silting up lakes, swamps and landsurface depressions, in suffocation of productive land and aquatic and marine life.

The above data show that as yet, the region's drought periods have little to do with minimum amounts of rainfall.

They are however determined by deficient landsurface percolation, in reduction of sub-surface water retention capacities and consequent depleting vegetation cover.

Annual rainfall of 650 mm, discharged in an equal timeframe as one of 230 mm, will provide a similar drought syndrome in the rain recipient area, with the sole addition of accumulated erosion and increased suffocating silt deposit from flood generation at lower altitudes.

The utilisation of existing erosive capacities and the transformation of siltation thereof into fertilisation, are the key to turn unabating decline and desertification into rain season

accelerated, perennial growth. Priority management of water velocities in the biosphere or the lack thereof, forms the simple mode of selection between irrevocable growth or Armageddon. Worldwide deforestation, ignited a humanitarian population growth, subject to, in geologic terms, short lived, however apparently beneficial conditions for survival.

Our previously, hydrodynamic climate, propelled by sufficient and uninterrupted evapotranspiration, turned thermodynamic from forest deficient temperature discrepancies and reduced landmass evaporation from consequent decreasing water retention capacities.

The United Nations High Commission for Refugees accommodated 120.000 people northwest of Burigi game reserve in western Tanzania, subjected to insufficient supply of food and energy.

A rapidly depleting wildlife population is the tangible result, while a local decrease in the region's isohyet from 1000 to 800 mm indicates the annual displacement of 720 million cubic meter of rainfall in the Victoria Basin, instigated by deforestation for energy provision.

This volume is transferred by the prevailing winds to the northeastern shore in Kenya, where three major land mass elevations; mount Elgon and the Cherangani-Nandi hills, dictate thermodynamic discharge in torrential rainfall, generating yearly recurring floods.

The selfreliance of more than five million subsistence farmers or one sixth of Kenya's human population is consequently terminated, holding the national economy and social fabric at ransom.

Should the affected population be able to spare and bring together the equivalent of four Euro per person, these flood risks can be eradicated within one year, requiring government facilitation only.

Research by the Technical University Delft confirmed that run off water could be stored sub-surface to plenish seasonal catchments into perennial status or saturate dilapidated aquifers at greater depth. Contour aligned trench formation is a low cost technology only requiring manual and/or mechanised earth moving equipment, to re-arrange soil and rock formation in permission of rain season induced (sub)-surface water storage.

The technique terminates erosion and generates instant vegetation cover recuperation in self-propelled expansion. Trees, shrubs and grass convert to uninterrupted growth, subject to a perennial hydrologic sub-surface saturation, permitting increasing wildlife and cattle populations.

Contour aligned trench excavation in a 45-degree angle, increases the arable land surface between eight and twelve percent, in simultaneous generation of year round and diversified agriculture extension.

Soil deposit in seasonal river beds and erosion gulleys, from trench excavation with the capacity to absorb El Niño maxima, permits extended, evaporation free, sub-surface water storage and land surface utilisation, in a stable erosion free environment.

The soil and rock regulated filtration of sub-surface discharge, permits non-mechanized rural and urban water provision, where required, subject to gravity in conduit administration only. Trench excavation along the contours of regions in jeopardy, at an inter-spacing of approximately ten meters, enables ground water table management, soil desalination and high quality potable (sub)-surface water production.

Sub-surface storage of run off water, brings road reserve maintenance into the norm and enhances existing infrastructure to all weather conditions.

Concrete and gabion constructions for conduit and protection, will only be required where roads cross perennial aquatic infrastructure.

Canopy deployment from afforested road reserves, further reduces road maintenance requirements and simultaneously initiates an uninterrupted and easy accessible certified wood production.

Shrub protection adjacent to road surfaces, terminates erosive run off and doubles as a shock absorbing buffer for traffic mishap.

An experiment by Kenya Wildlife Service, conducted in the Amboseli region, with annual rainfall between 200 and 400 mm, generated acacia forest development in a seven year hydrology sustaining maturity, subject to saturated sub-surface water accumulation.

The exclusion of wildlife interference resulted in declining growth thereafter, due to increased competition for survival from over-growth.

Afforestation as a hydrospheric management tool can be accelerated by high density planting of three year old seedlings, followed by a fifty percent harvest four years thereafter, in areas subjected to perennial hydrologic sub-surface saturation.

The vacated space from harvesting has to be occupied by grafted fruit tree seedlings at the species required inter-spacing, in conjunction with canopy management of the matured indigenous tree plantation.

Seasonal crop and upon maturity of the grafted fruit trees, commercial shrub will cover the remaining space, in creation of diversified and hydrology sustaining agriculture for hydrosphere management.

This mode of agriculture will sustain the majority of elderly people, remaining from populations hit by the HIV-Aids epidemic and will subsequently attract labour force currently locked in urban slum development.

As an example, the recurring floods of western Kenya can only be terminated by sufficient hydrosphere management, where hydrology sustaining agricultural afforestation is the socio-economic tool.

Research conducted in the Alpine region in Europe, revealed that mild rainstorms get entangled by surrounding land elevations and are consequently forced into complete discharge, generating extensive floods.

Heavy rains equilibrate from the lower, vapour saturated layers into higher altitude and flow over the surrounding land elevations in migrating discharge.

To terminate the region's flood risk, these mild rainstorms will have to be pre-empted before reaching the upper catchments, by enhanced vapour saturation and simultaneous temperature decline, in the rivers' hydrospheric intake trajectories.

Contrary to the general belief, reforestation of higher land elevations will accelerate erosion and increase flooding at lower altitudes, generating further decline of the region's utilitarian rainfall, in reduction of sustained perennial aquatic infrastructure.

The pre-emption of rainstorms is achieved when the sum of maximum atmospheric temperature decline and saturated land surface evaporation exceeds the thermodynamic property from temperature decrease required for discharge at higher altitudes.

The region's drainage altitudes vary between 1300 and 4000 meters with a temperature discrepancy of nine degrees in the mountain areas and twenty four degrees in the flood regions adjacent to lake Victoria; in a one degree Celsius temperature variation per hundred meter elevation.

Two hundred square kilometer of forest cover in Kakamega district, is sufficient to extract 1000 mm annual rainfall or 200 million cubic meters of water, at an altitude of 1650 meter. North of Kakamega forest is the forty-kilometer long boundary between Nzoia river's upper and lower catchment, situated at a similar altitude between mount Elgon and the Nandi hills. The 280 square kilometers subjected to trench excavation for agro-afforestation, will create, in this specific case, a required hydrologic shield in the atmosphere, pre-empting rainstorms in excess of 280 million cubic meters of water per annum, before reaching the upper catchment.

The consequent distribution in subsequent precipitation pattern between the lower and upper catchment, creates a time lapse in common utilisation of the Nzoia river's central stream, generating regulated drainage in sufficient accommodative capacity.

The reduction and consequent displacement of rainfall on the western side of the Victoria basin, instigated by the accommodation of 500,000 refugees subjected to insufficient energy supply; amount to 3000 million cubic meters or three cubic kilometers of water per annum. Approximately eleven cubic kilometer of reduced rainfall on the eastern sector of the basin, in Kenya and Tanzania, originates from deforestation for agriculture, energy supply and building materials.

The world's annual 70.000 cubic kilometer continental water vapour flow is consequently brought in a 0.02 percent turmoil from East-Africa's lake Victoria basin alone.

More then 100 million people in the region require wood for sustenance, collected in a similar mode as per the East African refugees, instigating the annual displacement of 555 cubic kilometer of water, in accelerating increase from an initial 0.8 percent adverse influence on the world climate.

The rate of acceleration is determined by regional wood consumption versus growth, demographic increasing demand, soil quality erosion, vegetation cover disruption, wild fires thereof and the reduction of perennial (sub)-surface water, subjected to flood and drought cycle from world climate change.

Situated between the tropical rain forest climate of the Congo basin with a 1500 mm isohyet and the Indian Ocean, the East-African region should sustain a common 1000 mm annual rainfall from the north and south easterly oceanic vapour flow circulation, terminating the submission to global flood and drought regime.

An analysis of the region's precipitation pattern from the last thirty years will reveal an adaption in circulation and discharge pattern, propelled by terrestrial vegetation cover alteration and perennial aquatic infrastructural reduction.

Bi-annual oceanic vapour flows, subjected to world climatologic flood and drought variation, are contracted by a decrease in rain inducing landmass, propelling consequent accelerated

discharge on remaining recipient land surface, further degenerating remaining vegetation cover.

From the last ten-year period in this analysis, one can determine the mode of alteration in circulation of East-Africa's water vapour flows and discharge pattern, created by deforestation of the Rutshuru-Bukavu-Uvira region in Congo for refugee sustenance.

The projected 12.000 square kilometer tropical rain forest destruction is consequently extending East-Africa's bi-annual rainfall regime from oceanic vapour flows, in reduction of the Congo basin's perennial tropical precipitation in sustenance of a 1500 mm isohyet. In other words, a volume of eighteen cubic kilometer of in situ generated water vapour circulation in perennial precipitation, is terminated.

The East-African region's contractive property on bi-annual oceanic water vapour flows from forest deficiency, in circulation over extended deforested landmass does not relax torrential discharge patterns. It accelerates excessive rainfall on higher inland elevations and diminishes precipitation in flat or relatively level terrain depressions, consequently subjected to flood water inundation, erosion and silt deposit thereof, progressing desertification.

The Rwandese and Burundese genocide and civil strife, culminated from obsolete farming methods, implanted during the colonial era and is the major propellant for adverse world wide climate change, generating aggravating poverty and subsequent sustained threat of social upheaval.

Contour trench deployment in a 45 degree angle, initially in the worst affected locations of the accidental high altitude regions from Rutshuru to Uvira and Bujumbura to Ruhengeri, will create a twelve percent arable land increase for agro-forestation, incorporating the economic accommodation for growing populations.

It will simultaneously re-instate the region under Congo's 1500 mm isohyet, reflected in perennial precipitation, permitting intensive, high revenue horticulture, in east bound economic propelled expansion.

Reconstruction of the hydrosphere from bi-annual rainfall to perennial precipitation in regions adjacent to rainforest under a 1500 mm isohyet, is of such simplicity and quick economic benefit, that government instigated display in the fabric of social hot spots, will suffice to trigger community propelled multiplication.

Recognition of the cohesion from man generated disruption in the East-African hydrosphere, is the first step to conciliatory management, required for climate engineering, which is based on the definition of the quantity, circulation and discharge pattern of oceanic water vapour flows entering the region's atmosphere.

From this analysis, consistent climatic hot and cold spots will emerge, reflected in sustained decreased or terminated rainfall and torrential discharge in consequent flooding, respectively. The cohesion between these precipitation extremes in conjunction with in situ existing land mass and vegetation cover conditions, dictate the sequence and mode of design, aimed at the reduction of temperature discrepancies and saturated evaporation for re-instatement of unhampered regional evapotranspiration capacities.

As an example, the rehabilitation of desert extremes into productive land, requires increasing sub-surface water retention capacities from contour trench deployment, in conjunction with thermal discrepancy propelled wind distribution of seeds and dust, to germinate into forest development; terminating erosion.

The sub-surface shelter from trench formation terminates erosion from high velocity run off water and wind storms, in creation of vegetation cover induced re-alignment and relaxation of contracted distribution from oceanic vapour flows.

Every month, four million inhabitants of the Nairobi urban area in Kenya, burn an average two million bags of charcoal for food preparation, requiring wood production with a length of 2000 kilometers in fifty-centimeter diameter, in conjunction with an estimated eight million liters of kerosene for hot water preparation and illumination.

Approximately one hundred million East-Africans can handle 300,000 square kilometer, in 0.74 acre per person, manual agriculture management.

High density afforestation in five meter interspacing thereof, subjected to one meter annual growth from contour trench excavation, provides the annual required 600,000 kilometer, 50 cm diameter wood production after three years, in sustenance of 1.6 million kilometer there ever after.

The transition from subsistence rain season dependant farming into perennial agro-afforestation, sustains the regio's food and energy supply for preparation thereof and converts volatile oceanic vapour flows into three hundred cubic kilometer reliable annual rainfall, in a 0.42 percent increment of the world's continental water vapour flow.

Through this transition, one sixth of East-Africa's approximately 1.8 million square kilometer land surface will come under uninterrupted forest canopy in generation of 1000 mm annual rainfall.

Charcoal is the cleanest, cheapest and most productive energy resource for agronomic societies in the tropical hemisphere and is a more favourable propellant for electricity production than hydro-electric power generation, should wood production therefore, be brought in equation with projected demand.

The production of charcoal from wood subjected to restricted fire, produces gas and charcoal as the potential propellant for decentralized, state of the art electricity generation at hand, reducing expansive grid deployment, required maintenance and energy loss thereof.

Emission of gas and ash from charcoal utilisation will be recycled through rain formation and manual distribution for fertilisation, respectively.

A network of 300,000 square kilometer agro-afforestation from policy implementation, produces 300 cubic kilometers utilitarian annual rainfall, covering 16.7 percent of the region's land mass and rain recipient potential. East-Africa has the capacity to arrest annual precipitation in excess of 1800 cubic kilometre of a 2.57 percent increment of the world's continental vapour flow; however the region apparently falls short on human resources to bring the 1,5 million square kilometer landmass, in rain generative accommodation.

Foreign aid in both manpower and capital is not an option, in an economic world climate, policed by sustained agriculture subsidies and trade barriers, instigating the mismanagement and consequent destruction of perennial water resources.

For example, one hundred million slaves from Western-Africa, farmed among others, at the basis of the United States' cotton growing industry, currently subsidised with USD 3.9 billion, or three times the US foreign aid to Africa.

The apparent inevitable deforestation, generates floods, wind and dust storms in the US up to the present day and facilitated West-Africa's re-colonisation by extensive rain forest cover.

About USD 350 billion in annual subsidies by industrialized nations, suppress world market prices below production costs, to the detriment of low and middle-income countries, amongst others in fossil oil sustaining West-Africa, where cotton is a major cash crop.

The European Union, with subsidies and trade barriers, in general even higher than those in the United States, stays focused on West-African oil and tropic hard wood, emanating from the human slave trade extraction in the former colonies. This hard wood is mainly utilised to enforce European aquatic infrastructure against floods, generated by worldwide deforestation. A conducted, economic substitution of cash crop production, subjected to world market price dictatorship; whereby a Japanese cow receives a daily government allowance of USD 7.5, is one requirement to eradicate the submission of in poverty enslaved 'third world country' populations, in daily survival of less than a dollar.

Historically, the majority of African agriculture was sustained in shifting cultivation, to permit nutrients from surrounding bio-diversity take the upperhand in the fertilisation of the rendered unproductive soils, under the auspicious stewardship of wildlife.

The segregation of wildlife through the administration in national parks and nature reserves, instigated the displacement and contraction of agriculture dependant communities and pastoralists, generating unabating deforestation and erosion, in reduction of perennial aquatic infrastructure for a growing population.

With the termination of shifting cultivation, the backbone of Africa's cyclic integrated agriculture and biodynamic nutrient generating complement from wildlife vanished.

It was replaced by stagnant and consequent declining subsistence rain-, fertilizer and pesticide dependant agriculture in generation of dwindling and isolated wildlife populations, envisaging extinction.

The region's survival and subsequent vibrant development to prosperity, is constituted in the re-instatement of shifting cultivation, in conjunction with forest management from sufficient wildlife distribution, as the propellant for the remaining 1.5 million square kilometer of East-Africa's landsurface, into rain generative accommodation.

Poverty is the least productive and consequent destructive, time exhausting mode of human life, aggravating decline of entire societies, terminating rainfall and consequent growth, in generation of cross boundary and trans-continental desertification.

The sufficient distribution of perennial growth, water supply and energy generation from contour trench formation into agro-afforestation, will stabilize East-Africa's agriculture sustaining population.

It will consequently liberate the time and available additional labour force, currently entangled in slum development, required for the additional quadrupling of agro-afforestation, in renewed permission of shifting cultivation.

Shifting cultivation in agro-afforestation, increases the region's utilitarian rainfall to 1500 cubic kilometer per annum, whereby favourable tropical temperatures and sun hours accelerate perennial growth of wood for industrial charcoal production, export and decentralized electricity generation.

The energy consumption of low and middle income households in the developing world, is in majority based on wood and charcoal, with the addition of fossil fuel products subjected to world market machinations.

This multi-billion consumer market can be utilized to decrease fossil fuel dependency through an increment in energy substitution from charcoal utilisation, in consequent deflation of the world market energy price and related industrial production cost.

The consequent increasing market value of tropical wood will reduce the industrialized world's insatiable demand for aquatic infrastructural rehabilitation, instigating commercial equatorial reforestation, economic growth and world climate pacification.

The subsequent generated economic respite, permits developing nations to withhold and process agricultural produce to imperishable status, in order to inflate detrimental world market price development; in simultaneous increased import potential of subsidised and consequent cheap products from the world market.

The termination through segregation of shifting cultivation in cross-pollination and fertilisation with subsistence wild-, bird and aquatic life, generated a worldwide decline in bio-diversity and annual increase of climate upheaval.

Eurasia's deforestation, instigated 13.000 years ago for stagnant agriculture, need for building material and energy supply, reduced northerly evapotranspiration to the Sahara savannah into a daily expanding desert, in subsequent destruction of amongst others Pharaonic Egypt and Nubia.

The culture perished in regular flood inundation and mass starvation from prolonged drought periods, followed by sand and dust storms only, propelled by solar heat generated temperature discrepancies from deserts and extensive deforested land mass.

The worldwide colonisation by this apparently successful agriculture, terminated amongst others, all rainfall slightly south of Cairo up to the fourth cataract, north of Atbara in Sudan, in extension to the Atlantic Ocean; generating cyclone formation towards the Carribean and the United States.

Cyclones derive from extreme temperature increase by reflective desert formation, in search of vapour saturation from oceans, cyclic propelled and accelerated in cold air for equilibrium.

Africa's shifting cultivation was systematically and inevitably terminated in the last century, brandished a backward technology; however it proves to be of highest revenue and sole sustainable means of food production, should the annual destruction in acceleration from wind, rain, thunder and fire storms, be taken in account.

The allocation of 16.7 percent of East-Africa's land surface, in uninterrupted grid deployment, will warrant the region's bio-diversity resource, to sustain shifting cultivation in agro-afforestation, independent from fossil oil consumptive means, such as fertilizers, pesticides, polythene cover and irrigation.

The network has to be made free of erosion from trench excavation and stone wall filtration, where applicable and can be left to wildlife management thereafter, to mature hydrologic saturation of East-Africa's biosphere, in conquest by benevolent social fabric.