Project Preparation Trust of KZN PO Box 5609 Durban 4000 Tel 031 305 1288 Fax 031 305 1227 www.pptrust.co.za

PPT Schedule of Alternative Technology Reponses

Notes: 1) This document is intended to assist municipalities, related communities and other entities involved in development. 2) This document is not a comprehensive guide to all alternative technologies. 3) This document is a 'living' document – comments and inputs are welcome (pptrust@worldonline.co.za / 031 3051288).

1 Summary List of Potential Alternative Technologies

NOTE: This list references with the detailed schedule which follows – i.e. the detailed schedule follows this list item by item in the same sequence and utilizing similar numbering.

1.1 Alternative Energy
- 1.1.1 Solar – photovoltaic power, solar water heaters,, solar cookers
- 1.1.2 Wind – small turbines, large turbines, wind farms
- 1.1.3 Biogas – small household units, for small social facility
- 1.1.4 Landfill gas
- 1.1.5 Alternative technology cookers & heaters – gel fuel cookers and water heaters, solar cookers, LPG gas, retained heat cookers (hot bags), efficient wood burners, biomass burners, wood gas cookers
- 1.1.6 Woodlots for fuel
- 1.1.7 Irrigation: Ram pumps; Spiral wheels, gravity feed
- 1.1.8 Integrated Energy Centres
- 1.1.9 Water – small water turbines, wave energy
- 1.1.10 Nuclear

1.2 Alternative Water Management
- 1.2.1 Grey water recycling
- 1.2.2 Water demand management (including water conservation, fixing leaks, etc)
- 1.2.3 Structured / incremental water usage billing
- 1.2.4 Rainwater catchment

1.3 Waste Treatment, Recycling and Disposal
- 1.3.1 Solid waste recycling
- 1.3.2 Mechanical biological waste treatment

Note the role of the following approaches / tools in respect of solid waste: Command & control, information systems; Economic Instruments
- 1.3.3 Sewage Treatment alternatives

1.4 Green Buildings
- 1.4.1 Incentive schemes for residents / business / industry
  - a install / utilize swh
  - b Waste disposal and recycling
  - c Waste water recycling
  - d Green building design
- 1.4.2 Low income housing innovations

1.5 Automobiles

© Project Preparation Trust of KZN 2008. All Rights Reserved.

- 1.5.1 Tax / rates rebates for owners of cars with small carbon footprint – small engine capacity
- 1.5.2 Alternative fuels for automobiles:
  - a Biodiesel (contentious)
  - b Ethanol

1.6 Agriculture / food production:

- 1.6.1 Permaculture
- 1.6.2 Homestead gardens
- 1.6.3 Fruit and indigenous tree establishment
- 1.6.4 Alternatives to pesticides
- 1.6.5 Composting
- 1.6.6 Watercapture/harvesting
- 1.6.7 Drip irrigation

1.7 Green Infrastructure:

- 1.7.1 Greenways
- 1.7.2 Rain-gardens
- 1.7.3 Wetlands Restoration
- 1.7.4 Trees
- 1.7.5 Green Roofs
- 1.7.6 Swales
- 1.7.7 Porous Pavement
- 1.7.8 Native Landscaping

1.8 Water capture : boreholes, gravity feed, ram pumps etc

1.9 Atmospheric carbon reduction and carbon trading

© Project Preparation Trust of KZN 2008. All Rights Reserved.

2 Detailed Schedule of Potential Alternative Technologies

CAUTIONARY NOTE: IT IS EMPHASISED THAT THIS SCHEDULE IS A WORK IN PROGRESS. DUE TO BUDGETARY AND TIME CONSTRAINTS, AS WELL AS THE EXTENSIVE SCOPE OF THE TOPIC OF ALTERNATIVE TECHNOLOGIES, MUCH OF THE INFORMATION CONTAINED HEREUNDER IS PRELIMINARY IN NATURE AND IN SOME INSTANCES THERE ARE INFORMATION GAPS. THIS WAS UNAVOIDABLE. NONETHELESS THE INFORMATION PROVIDED IS GENERALLY A SUFFICIENT STARTING POINT FOR THOSE INTERESTED IN PURSUING ALTERNATIVE TECHNOLOGIES OF VARIOUS KINDS IN REACHING A GREATER UNDERSTANDING OF WHAT THEY CONSIST OF AND WHO THEY MAY USEFULLY BE TAKEN FORWARD AT THE PROJECT LEVEL.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
1.ALTERNATIVE ENERGY						
1.1 Solar Small Household Photovoltaic System (65w)	Solar powered electricity system sufficient to power 5xCFL's, radio, cell phone charger. Consists of a 65w solar panel, deep cycle battery, 5 x compact fluorescent lights, controller/invertor to protect battery and convert 12V to 2220V.	Good sun regime (i.e. most of SA); customer willing to make financial contribution; community buy-in; effective project team including project manager and facilitator who understand small PV systems; grant funding.	Approx. R6,000 for equipment and installation excluding project management and facilitation costs.	Uses 'free' and clean solar energy; low operating and maintenance costs – only cost is replacement of battery every few years.	1) Project Preparation Trust – 031 301288; 2) Bosco (Herman Bos herman.bosco@gmail.com 083 632 0395); 3) Agama Energy (Greg Austin - 021 701 3364);	Welbedacht (eThekwini; Dududu (Vulamehlo)
Solar water heaters	*Note – for more detailed information refer to section 4.1 below under Green Buildings.* Direct radiator solar water heaters typically consisting of: a) black metal pipes inside a black glass fronted 'box'; b) a header tank mounted above the tank. Cold denser water in the tank sinks into the hot pipes in the box and the hot less dense water flows back up into the tank creating a constant circulation. There are various types: a) a relatively cheap type which works independently of an electric geyser and is relevant in rural	• Water connection to the house / building • Available up front cash / capital for the installation (pay back periods may vary from anywhere between three years to approx. 8 years) In additional, a more conducive regulatory and incentive environment would	See under description	Uses 'free' and clean solar energy; low operating and maintenance costs; payback period varies from between approx. 3 and 8 years	Numerous	Low income: Welbedacht (eThekwini) Middle income residential and industrial: many

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	areas (usually a 100-150L tank with panel attached mounted on roof with limited plumbing with a total cost of approx. R5,000 excluding delivery and installation; b) a more expensive residential variation which works together with an electric geyser and is more relevant for urban areas – it is noted that, to make use of the Eskom's pay back subsidy an electrician's certification and tamper proof seal are required which utilize a substantial portion of the available subsidy. Costs range from at least R6,000 for a basic 150L and R10,000 for a basic 300L upwards EXCLUDING installation etc. of R3,000 to R5,000. c) industrial and commercial applications.	greatly assist (e.g. municipal bylaw requirement for installation on urban new build; more aggressive tax / eskom rebates etc				
Solar cookers	Refer to 1.5 below					
1.2 Wind Small household wind turbine (e.g. 150w)	Wind powered electricity system sufficient to power 10 CFL's, radio, cell phone charger. Consists of a small wind turbine (approx. 150w), deep cycle battery, 10 x compact fluorescent lights, controller/invertor to protect battery and convert 12V to 2220V.	Good wind regime (e.g. coastal hills); customer willing to make financial contribution; community buy-in; effective project team including project manager and facilitator who understand small wind power systems; grant funding.	Approximately R10,000 for equipment and installation excluding project management and facilitation costs.	Uses free, clean and renewable wind energy; low operating and maintenance costs – only cost is replacement of battery every few years.	1) Project Preparation Trust – 031 301288; 2) Bosco (Herman Bos herman.bosco@gmail.com 083 632 0395); 3) Agama Energy (Greg Austin - 021 701 3364);	Dududu (Vulamehlo)
1.3 Biogas Small household biogas unit	Biogas is methane(CH4) gas or natural gas. It is produced by the breakdown of organic material by bacteria without the presence of oxygen. To harness this renewable energy, a biogas digestor (BGD) is constructed and filled with human waste (where possible	A waterborne sanitation system or discharge from greywater use A constant stream of water is required (either grey water or household effluent)	Approximately R15,00-R20,000 including all equipment and fitting, using jojo tank option, and including project management.	The household health benefits can be summarised as follows: • reduced respiratory and eye infections • reduced diseases related to our sanitation, such as Cholera and other	Khanyisa Projects (Lawrence Ngubane / Nick Alcock 031 208 3636)	Indanda, Cato Manor,

[1] http://sgp.undp.org/download/SGP_Tanzania2.pdf

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	augmented by nitrogen rich cow dung) and water (a flush toilet can be incorporated into the system if need be) 1 cubic meter of biogass is equivalent to 11kg of liquid petroleum gas. This output requires a 4 cubic meter volume biodigester. [1] Primary treatment: First the effluent is screened to remove inorganic solids (stones, plastic bags). Then sand and grit are removed and other solids are removed by gravity settling. Secondary treatment: Two basic types of biological treatment after that: anerobic (without oxygen) and aerobic (with oxygen) Aerobic: microorganisms use the biological content of the waste in the presence of oxygen and cause cell growth (sludge) as well as water and carbon dioxide as end products. Anerobic: microorganisms break down organic material into methane and carbon dioxide. After secondary treatment water can only be used for irrigation. Tertiary treatment: this involves filtration and addition of chemicals which makes the water potable. Constant water stream is needed: flush and grey water streams are useful	Livestock manure will increase the biogas yield	Container to hold waste material (jojo tank or cement) in anaerobic conditions and capture gas Pipework system to transfer gas to point of use (solid structure or prefabricated e.g. jojo tank) Whilst accurate cost norms are not readily available, it is estimated that the indicative costs of a system using a converted 'Jojo' tank would be between R15,000 and R30,000 including all hardware (tank + piping + fittings etc) and installation.	diarrhoeal diseases, and diseases related to groundwater pollution (99% of bacteria present in faeces and dangerous to people – pathogens such as *E-Coli* and *Ascaris ova* – are killed in the process of producing biogas) • free energy (after initial costs) where before there was no power • the reduction in menial women-based tasks such as firewood collection (on average 1.5 hours per household per day for more productive end uses) • improved animal dung and human excrement management • improved crop production through the increased use of the digested manure • reduced groundwater pollution • reduced deforestation with its concomitant soil erosion • reduced greenhouse		

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
				gas emissions		
1.4 Landfill gas	Landfill gas is produced by wet organic waste decomposing under anaerobic conditions in a landfill.[2] Landfill gas typically contains 50-60% CH_4 (methane) and 40-50% CO_2 as it is generated.[3] Landfill gas can be used for direct end use (e.g. as a replacement for LP gas), or for electricity generation (indirect end use). The most cost-efficient process for landfill gas is direct end use as a fuel which includes using it for firing furnaces, as a boiler fuel and domestic use.	Direct end use requires an end user within 2 to 3km of the landfill site, preferably with a continuous demand similar to gas energy, and preferably with a process that can use dirty, low calorific value gas. Emissions Reduction EIA leading to a Purchase Agreement with a purchaser of carbon credits (such as the Prototype Carbon Fund of the World Bank or governments such as Canada and Denmark that do direct purchasing)	Landfill gas is collected from landfills by drilling "wells" into the landfills, and collecting the gases through pipes linked to an underground main gas collector and extracted via a roots blower system which maintains a partial vacuum in the pipes resulting in the gas being sucked out of the landfill. Equipment required includes: Landfill gas detectors, landfill gas recovery wells, gas flares and electrical gas generation units. This requires large capital costs.	1) Generating renewable energy from landfill gas and trading the resultant carbon credits from these kinds of CDM (United Nations Framework Convention on Climate Change: Clean Development Mechanism) activities will create economic growth in South Africa. Consequently, it will stimulate employment opportunities, poverty alleviation, trade, investment and sustainable development. 2) The capital and running costs of landfill gas infrastructure is usually lower than other renewable energy resource technologies such as wind farm, wave and hydropower options.	1) **Envirotech Solutions (pty)Ltd** Contact Brendon Jewaskiewitz (Kloof) Tel: 031 764 1555 Fax: 031 764 1555 Cell:: 082 927 3071 Email: flycatcher@mweb.co.za **2) Wilson and Pass Incorporated** Contact Jonathan Pass Tel: 031 267 2583 Fax: 031 267 2583 Email - jon.pass@pixie.co.za	1) Three sites in eThekwini municipality: ° Mariannhill Landfill Site ° La Mercy Landfill Site ° Bisasar Road Landfill Site 2) Weltevreden landfill site pilot project in Brakpan, eastern Gauteng (started in 1999)
1.5 Alternative technology						

[2] Over 90% of waste in SA is deposited in landfills. The waste is covered and compressed mechanically and by the weight of the material that is deposited from above. This material prevents oxygen from accessing the waste and anaerobic microbes thrive. This gas builds up and is slowly released into the atmosphere if the landfill site has not been engineered to capture the gas.

[3] CH4 has at least 21 times more effect as a greenhouse gas than CO^2. Therefore, reduction of CH4 is critical in reducing global warming.

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
cookers & heaters						
Gel Fuel stoves	Stove which operates on gel fuel with 24 months supply (10L jar per month)	Household acceptance of technology, willingness to contribute financially; on site demonstrations; suitably skilled project manager and facilitator	R250 (Suncatcher) R2,500 for stove and 24 months supply	Uses free and clean solar energy. Safer than paraffin and cleaner burning. Uses renewable plant inputs (vs oil).	Greenheat - Contact details available from PPT (Nana Ndlovu – 031 3051288) Richard Poecock 072 456 0636 - alternativeworks@gmail.com	Many projects including Welbedacht (eThekwini; Dududu (Vulamehlo)
Gel Fuel water heating	Gel fuel heats a chimney which is surrounded by a jacket filled with cold water. The water is heated by the chimney and a tap can be opened to provide a hot shower. Can be plumbed into a water source, attached to a hosepipe or filled from a 20 liter tank (i.e does not required a household water connection). Mixer tap included to adjust temperature of shower	Household acceptance of technology, willingness to contribute financially; on site demonstrations; suitably skilled project manager and facilitator; access to gel fuel and nearby water source.	R900 excluding transport and fitting	Portable and fairly space-efficient, and therefore ideal for rural homes, informal settlements or low-cost housing. No plumbing required. Runs on ethanol gel, therefore no emissions. Heat from chimney can be directed outside in summer and used as space heater in winter. No risk of spillage and fire.	Imvula Enkulu Robins 031 708 2289	Currently being tested by PPT
Solar cookers	Parabolic type solar cooker	Can only cook effectively when there is less than 50% cloud cover; Household acceptance of technology, willingness to contribute financially; on site demonstrations; suitably skilled project manager and facilitator	R2,000 for cooker (parabolic type)	Uses free and clean solar energy – however can only be used when less than 50% cloud cover and only during the day.	Sunfire Solutions +27 (0) 11 624 2432 Sunstove Organisation (011) 969 2818 Solar Works 031 261 6881	
LP gas	Prepackaged LP gas used mainly for for cooking as well as limited lighting, water heating, space heating and refrigeration. Also has application in small scale	Requires local supply network (currently generally only available in urban areas), suitable	Approx R17.00/ kg 9kg cylinder (incl deposit) is currently	Clean burning, efficient and safer than paraffin. Can be used for a wide variety of purposes –	SASOL BP Caltex Total	Widely used throughout SA Highflats IEC has

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	commercial enterprises, community services and small scale farming.	appliances (may pose a high initial cost to the household). The price of LP gas is susceptible to rapid fluctuations which may make it unsuitable for low-income households.	approximately R153.00	heating, lighting, cooking, refrigeration, manufacturing and processing	Engen Afrox Liquefied Petroleum Gas Safety Association of Southern Africa +27 (0)31-563 3535	distribution network in place for a low-density low-income rural area
Retained heat cookers ('hotbags')	Insulating hotbags for cooking (place pot after contents have boiled into box and allow to cook). Can be used in conjuction with any other cooker (e.g. solar, gel fuel, LP gas etc) to reduce cooking time on flame and hence fuel usage.	Household acceptance of technology, willingness to contribute financially; on site demonstrations; suitably skilled project manager and facilitator	R200	Conserves heat thereby saving significant energy (at least 50% on a dish like a stew)	The HotBag Project 083 539 5192 hotbag@mweb.co.za	PPT Pilots at Dududu (Vulamehlo), Welbedacht (eThekwini) Cookstove system Save80, Lusaka (UNFCC CDM project)[4] Kakamenga Basket, CCI Kenya[5]
Efficient wood burners	Wood burning ovens/ stoves that emit less than 2 – 7 grams of particulate emissions in one hour (compared to emissions of 30 – 50 grams per hour in non-efficient stoves)[6]	Household acceptance of technology, willingness to contribute financially; on site demonstrations; suitably skilled project manager and facilitator; access to wood, particularly twigs	R200 to R400	Burn wood much more efficiently; pipe harmful smoke out of room via chimney or reduce smoke entirely. Some models are portable.	New Dawn Engineering (+268) 518-5016 or 518-4194 Matsapa, Swaziland	Variable energy stove Mirte improved stoves Shisa stove, Swaziland Tsotso stove, Swaziland & Zimbabwe
Biomass burning stoves/ ovens	Biomass materials such as sawdust and woodchips, rice husks, grain husks and corn husks, firecubes (made from recycled paper and sawdust), dung. Pellets can be made by using resin or other naturally occurring material as a binder	Household acceptance of technology, willingness to contribute financially; on site demonstrations; suitably skilled project manager and facilitator; access to suitable biomass fuel	R400	Can use a wide range of fuel, often by-products (e.g. sawdust, peanut shells, corn husks) that are not used for any other purpose. Burns efficiently and therefore has low levels of particulate emissions. Production of	New Dawn Engineering (+268) 518-5016 or 518-4194 Matsapa, Swaziland	Anila biomass gasifier stove, Tamil Nadu, India Shisa stove, Swaziland

[4] http://cdm.unfccc.int/index.html
[5] http://www.communityconservation-initiative.org.uk/
[6] Environmental Protection Agency, www.epa.gov/woodstoves

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
				firecubes provides an appropriate technology micro-enterprise oppoirtunity (recycled newspaper and sawdust pressed into cubes and dried).		
Wood-gas cooking stoves	Gasifiers that produce gas from wood and then burn the gas, leaving charcoal. Burn small pieces of wood, sticks, wood chips, corncobs, nutshells and other biomass fuels	Household acceptance of technology, willingness to contribute financially; on site demonstrations; suitably skilled project manager and facilitator; access to suitable biomass fuel	To be determined	Uses a wide range of fuel and produces charcoal.	New Dawn Engineering (+268) 518-5016 or 518-4194 Matsapa, Swaziland	Anila biomass gasifier stove, Tamil Nadu, India Shisa stove, Swaziland
1.6 Woodlots for fuel (subsis-tence)	Small planted woodlots to provide a renewable firewood resource and to reduce the pressure on indigenous forest where these are under pressure.[7]	Risk of planting non-indigenous plants which proliferate (e.g. wattle). The risk of small woodlot timber being 'poached' by timber companies is regarded as minimal given their small subsistence nature (in contrast to woodlots established as community enterprise initiatives). It is noted that where existing alien vegetation such as scrub wattle is present, this should first be harvested, as commonly occurs	Community buy-in. Limited training-. Seedlings and water for planting and follow up irrigation where conditions are dry. Protection of seedlings from cattle.	Reduces impact on indigenous forest. Provides a renewable fuel. Carbon emissions can be reduced if woodlots are combined with fuel efficient wood burners.	Not determined	Not determined

[7] Woodlots are generally considered to be woodland or forest capable of small-scale production of forest products such as wood fuel (as distinguished from small-scale timber farming). Distinguishing characteristic of a woodlot is that the parcel size or quality of wood on the parcel does not generally justify full-scale commercial harvesting. On the other hand, good forest management practices, even on a small scale, may create a sustainable source of fuel. Woodlots can also act as a biomass energy "savings account".

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
		through programmes such as 'Working for Water'.				
1.7 Irrigation Ram Pumps	A ram pump is a device that uses the kinetic energy of flowing water to pump water using water from a low elevation to a higher elevation It is designed to use the power from a flowing stream to pump water up a directed pipe into a reservoir or tank Ratio: 1 meter fall pumps 10 meters vertical height	A flowing stream where there is a fall (i.e. a drop in level of water)	R30,00 to R40,000 for a complete system including all equipment, fittings, facilitation and project management. Ram pump : (±R8 000) Storage Tanks: R5 000 for 5000 litre Galvanised pipes 40 mm Delivery Pipe: LDPE 32mm Taps, valves, etc.	No fuel or oil is required Limited maintenance required as there are few moving parts Less energy and time is used fetching water from rivers	Khanyisa Projects (Lawrence Ngubane / Nick Alcock 031 208 3636)	
Spiral Wheels	A spiral wheel is a device that uses the energy of flowing water (there does not need to be a fall, as with ram pump) to force water up the delivery pipe to storage tanks. The water flows into the outer pipe and forces the spiral wheel to begin turning as it floats on the surface of the river. The spiral wheel is kept in position using restraining wires	A fast flowing stream and enough depth to allow the spiral wheel to float	R30,00 to R40,000 for a complete system including all equipment, fittings, facilitation and project management. Spiral Wheel: (±R8 000) Storage Tanks : R5 000 for r 5000 litre Delivery Pipe: LDPE 32mm Taps, valves,	No fuel or oil is required Limited maintenance required Less energy and time is used fetching water from rivers	Khanyisa Projects (Lawrence Ngubane / Nick Alcock 031 208 3636) Centre for Environment, Agriculture and Development (CEAD), UKZN 033 260 6223 www.cead.org.za	
Gravity feed	In many instances water can be largely	Water source at a	Variable – but no	No ongoing maintenance	Various	Not determined – but

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	gravity fed either in trenches or pipes or a combination of them, usually necessitating a small weir or water collection point on a river	higher elevation and with a relatively short supply route possible with a steady gradient drop	pumping equipment required or ongoing maintance			not common (refer to water service authorities and DWAF for project case studies)
1.8 Integrated Energy Centres	Local centre with the typical function of distributing and selling energy products and fuels as well as providing information on energy. The centres are usually modelled on ownership and control by a petrol company, although an alternative model is one of community co-operative ownership (e.g. Highflats IeC). Other models of ownership and control are presumably also possible (e.g. local entrepreneur). Products / energies provided would typically include the following: solar home systems, solar cellphone chargers, gelfuel and stoves, leisure batteries, energy efficient lights, LP Gas and stoves, airtime and prepaid electricity etc.	1) Sufficient management capacity (either local or via an external entity) – especially a ' guiding hand / tech support w.r.t technical and commercial / profit issues; 2) business skills training available for co-op management; 3) up front 'needs' analysis of the area; 4) transport – co-op must have a vehicle; 5) direct purchase of products from suppliers to keep costs down (not via intermediaries (esp. items like solar panels etc).	1) Sufficient management capacity (esp. w.r.t tech issues and business skills; 2) Up front grant to kickstart and enable setup and stock accumulation highly desirable; 3) Transport (e.g. bakkie).	• Reduces the number of 'middle men' in the supply chain, thereby reducing the costs of local energy. • Provides alternative technologies which would otherwise not be available or easily accessible. • Creates / stimulates local income generating opportunities. • Helps to promote education and information dissemination on energy issues.	Bosco (Herman Bos herman.bosco@gmail.com 083 632 0395) (consultant on Highflats IeC Project).	Highflats Integrated Energy Centre (co-operative ownership model)
1.9 Water Small water turbines	Information on this was not available at the time of writing. However it is noted that Eskom in the Eastern Cape have reportedly implemented some micro hyrdo schemes. Some of the key factors to be determined in the event of anyone making follow up investigations would include: a) threshold river size and flow rates requireds; b) cost benefit analysis.	Sufficient head or flow of water throughout the year				
Wave energy	NOT RELEVANT TO UTHUKELA – In addition it is noted that production of energy from wave action would usually					

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	entail large and capital intensive projects requiring support and finance from national government / DME					
1.10 Nuclear	CONTENTIOUS AND MORE APPROPRIATELY DEALT WITH BY THE NATIONAL SPHERE OF GOVERNMENT (although some would argue that it does in fact have a lower carbon footprint than power generation from fossil fuels, there are a range of other environmental concerns).					
2. ALTERNATIVE WATER MANAGEMENT						
2.1 Grey water recycling	Grey Water is water that has been used before. It includes water that has been used for washing and cooking but does not include toilet water[8].					
2.2 Water demand management	Reduction of water demand through various means including: a) identifying and fixing leaking pipes, reservoirs etc; b) changing consumer usage practices to reduce consumption – both household and business / industrial – this could include the use of innovative tariff systems which reward lower consumption, promote on site use of greywater , promote on site recycling and re-use mainly by industry.	Commitment from water service authorities to: a) resolve water leakage problems; b) innovate w.r.t tariff systems combined with consumer awareness and technical support for consumer innovation (e.g. on site recycling by industry)	Various	Aside from water itself being a scarce commodity, it also comes with a significant energy cost attached to it	Mike Raab, Watergy Project (contact details available from PPT)	Watergy project (USAID funded) – Mike Raab
2.3 Structured/ incremental water usage billing	See above			As for 2.2		
2.4 Rainwater catchment	Rainwater catchment can be achieved through various means, the most important of which is probably rainwater tanks, whether on residential homes or within industry.	Commitment from water service authorities and local authorities to innovate w.r.t bylaws and rates incentive	Various	As for 2.2	Not determined	Not determined

[8] www.seed.org.za/permaculture.php?articleId=31

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
		schemes to incentivize residential, commercial and industrial buildings / owners to fit rainwater tanks as part of new builds (incorporated in plans for approval) as well as retrofit. It is noted that ultimately incentives via the overall taxation system should also be considered at the national level to promote various forms of alternative technologies.				
3 WASTE TREATMENT, RECYCLING AND DISPOSAL [9]						
3.1 Solid waste recycling	Although global best practice dictates that communities need to move towards less (or zero) waste production (rather than finding ways to better manage the waste that is currently produced), nevertheless, efficient waste management approaches do need to be in place. The most significant amongst these is **Recycling** which involves processing used materials[10] into new products in order to prevent waste	Recycling generally works better in urban areas and is easiest to implement in relation to ratepayers. Prior to implementing a recycling programme, a cost-benefit analysis should be conducted in	The preconditions listed for waste disposal systems also relate to resources required. Costs will vary dramatically and would need to be determined by detailed feasibility	Benefits of recycling: • Reduction of greenhouse gas emissions • Space saving in landfill sites • Reduction of landfill costs • Organic waste	1) EcoMonkey (KZN head office in Ballito) Mel - mel@ecomonkey.co.za 083 297 1778 2) Mondi Paper Recycling 3) For PET recycling - AT Environmental Waste	City of Cape Town is the first to introduce a bylaw relating to waste management. It came before Council on 30 March 2009 Overstrand municipality provides clear bags in exchange for bags of

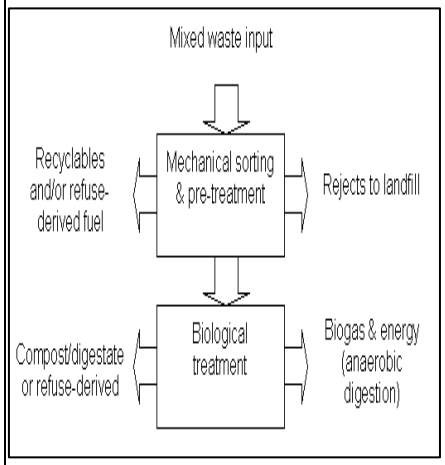
[9] **Important note:** the National Environment Management: Waste Act was passed in March 2009

[10] Recycling should strictly lead to more materials of the same kind being reproduced from those that are being recycled (eg recycled paper is used to make more paper) but sometimes this is too difficult or more expensive than producing more of that material from scratch so instead they are used to produce different materials (eg recycled paper being used to make carboard). Recycling could also involve the breakdown of complex materials into simpler materials that are valuable, such as the extraction of lead from batteries, or hazardous, like mercury. Recycling can in some instances waste more resources than it saves, especially in cases where it is mandated by the government. However, municipal recycling is worthwhile if the net cost of the recycling system is less than the landfill or other disposal costs for the same amount of material. Types of recycling systems include drop-off centres, curbside collection and buy-back centres.

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution (from landfilling), and lower greenhouse gas emissions. Recyclable materials include glass, paper, metal, plastic, textiles, and electronics as well as biogas (referred to elsewhere in this document). Materials to be recycled are either brought to a collection center or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials bound for manufacturing.	relation to the costs of traditional waste disposal. **Preconditions** for waste disposal systems include: 1) Adequate infrastructure; 2) Adequate personnel;3) Adequate financial resources; c) Adequate enforcement of relevant policies/ legislation	and cost benefit analysis work.	residue from plants can be utilised in composting facilities • Should there be sufficient volumes, waste can be converted to energy • Collection, transport and recycling of waste products provides a number of income-generating and/or employment opportunities, and is usually a person-intensive process.	Solutions (Alex Bervoets) Tel : 031 902 3542 Fax: 031 902 6530 Cell: 083 448 6420 4) 4) Nampak (metals, plastic, paper, glass) 5) MRFCo (design and construction of materials recycling facilities) Tel: 031 502 9542 6) Gavin Eichler/ Frans Du Toit 083 308 4818 ecosystems@mweb.co.za	recyclables which are sorted and sent to markets. About 5 people make a sustainable living from the project. eThekwini Municipality is currently piloting a paper recycling project where households are provided with orange rubbish bags strictly for paper, which is collected by the municipality at the same time as other refuse.
3.2 Mechanical biological waste treatment	A **mechanical biological treatment** system is a form of waste processing facility that combines a sorting facility (either automated or manual) with a form of biological treatment such as composting or anaerobic digestion. MBT plants are designed to process waste such as municipal solid waste and sewage sludge, to produce high calorific fuel or refuse defined fuel (RDF)[11] which can be used in cement kilns or power plants This is largely composed of plastics and biodegradable organic waste. Other outputs of the MBT process are: - Recycable materials such as metals, paper, plastics, glass etc. - Organic fertilizer (separate collection of organic waste) - Unusable materials prepared for their unharmful final deposit - Carbon credits (additional revenues)	Requires sufficient capacity for collection, possible at-source separation of waste (i.e. by households / industry) and sufficient waste generated within a geographical area to achieve sufficient economies of scale.	Generally requires processing plant, collection vehicles, technical staff and sorting staff. At present, all MBT plants in SA are outsourced by municipalities to private waste management companies. Several cities (e.g. Cairo, Mumbai, Rio de Janeiro) also offer waste-picking contracts to co-operatives of micro-entrepreneurs.	Waste volume produced is approximately half of what it would have been without MBT, so the lifetime of the landfill is extended. Leachate is utilized in the process. No pests (birds, dogs, vermin, rats) on site No biogas produced that needs to be burned off Daily covering not necessary	1) EnviroServ Kwa-Zulu Natal Tel: 031 902 1526 Email: info.kzn@enviroserv.co.za 2) Re- (total waste management solutions) Tel: 031 902 3536	

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
						
3.3 Sewage treatment alternatives	Need to look for systems where human waste can be reused, where use of potable water is minimised and which are easy to use and maintain. 1) Biological trickling sludge plants 2) Biological nutrient removal activated sludge plants 3) Biogas capture and utilisation It is understood that the first two of these are already mainstreamed in South Africa, with biogas capture from sewage treatment works still in the early stages but with some projects underway (e.g. eThekwini) It is noted that there are also various solutions possible at the households level in respect of processing household sewage	Preconditions vary depending on the method – however for sewage biogas the preconditions will be similar to landfill gas above and would include: a) plant suitable for conversion or new build fit for purpose; b) sufficient scale of waste; c) potential for piping off gas or using it for power generation on site	Variable	- Stop pollution of soil, groundwater and rivers on a long term basis - Development is now possible in areas where no pipes sewerage is available - Save on water costs by using plant outlet for irrigation - Less expensive than sewage pumping plant - Water born sewerage now available to a larger section of our community - No or infrequent collection of sewage/sludge by municipalities	1) Scarab Treatment Systems (for domestic biofilter domestic sewage treatment - Modular system that can process between 1000 and 150 000 litres domestic effluent per day0 Water. http://www.scarabsa.co.za . **Tel**: + 27 31 464 1703 **Fax**: + 27 31 464 1726 2) Biogeza –domestic and industrial 011 452 6800 info@famsys.co.za 3) Khanyisa Projects (Lawrence Ngubane / Nick	BoschenVaal in FS region (Scarab) Gansbaai wastewater treatment works – first full-scale domestic sewage treatment works currently undergoing 12 month testing.

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	(e.g. biodigestors)				Alcock 031 208 3636)	
4 GREEN BUILDINGS						
4.1 Incentive schemes for residents/ business/ industry	Green building is the practice of increasing the efficiency of buildings and their use of energy, water and materials, and reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal – the complete building life cycle. As consumers (both private and commercial) are not applying green building technologies on a large scale at the moment despite the imperative for all aspects of our lifestyles to become more environmentally friendly, incentives to encourage their use may be necessary. Incentives may be either: investment incentives (relating to the cost of installing/ purchasing appropriate technologies), or production incentives (relating to the amount of water or electricity drawn from the service provider)	These schemes cannot be implemented effectively unless a well-functioning administration system is in place.		There are numerous benefits to green building technologies: **Environmental benefits:** • Enhance and protect ecosystems and biodiversity • Improve air and water quality • Reduce solid waste • Conserve natural resources **Health and community benefits:** • Improve air, thermal, and acoustic environments • Enhance occupant comfort and health • Minimize strain on local infrastructure • Contribute to overall quality of life **Economic benefits** The main potential for employment creation in this sector lies in the manufacturing of energy-efficient products rather than in installation and maintenance. As most of these products are currently imported; it		

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
				would be a step in the right direction to create an enabling environment through government incentive schemes for the creation of local manufacturing enterprises. Local electricians and construction workers could embark on reskilling and upskilling programmes and thus move up the 'technology ladder' to be employed in jobs with better conditions.		
Installation of solar water heaters	Solar hot water refers to the use of the sun's energy to heat water for household and industrial use. Solar water heating systems generally consist of the following components: 1. A solar collector 2. A storage vessel 3. A heat exchange fluid in the case of indirect systems 4. A pump in the case of an active system Schemes to encourage individual homeowners and businesses to introduce solar water heaters may include: A) financial incentives (e.g. subsidies, tax or rates rebates)[12] in order to encourage the replacement or supplementation of existing electrical geysers as well as their installation as part of new builds B) The use of bylaws and other legislation / regulations (e.g. by making it obligatory for new building to include solar water heating. C) Bank financing for solar water heaters	Reticulated water supply or tank water supply to building / house. In addition, and given that uptake is currently insufficient: • Introduction of compulsory installation of solar water heating on new builds (e.g. via municipal bylaws or other legislation) in ord. • Increased subsidy to low income households (e.g. 'RDP' housing). • Possible increase to Eskom rebate. • Possible	A. Low cost solar water heaters, with a simpler design and suitable for low income housing cost in the region of R5,000 (excluding installation). B. A typical solar water heater system, suitable for a middle income family of four in an average home with an electricity bill averaging R500 per month, could cost between R8 000 and R20 000 including installation and electrical	About 50% of the cost of household electricity is generated by geysers. Replacement of these with solar water heaters will reduce costs to individual households and pressure on the grid.[15] Given the high number of days of sunshine in SA (about 292 per year), solar water heaters are particularly effective. A domestic SWH with a two square metre collector could harvest up to 2,000 kWh (kilowatt hours) of energy from the sun every year.	There are many suppliers. Two of those accredited by Eskom last year were: 1) Alt E Technologies (KZN) 083 412 2718 2) Solar Beam 031 563 9585 solarbeam@netactiv.co.za Suppliers of low cost geysers include: Bosco 031 266 1282 New Energy Technologies 011 880 5484	PPT has installed solar water heaters at Welbedacht (eThekwini) and Dududu (Vulamehlo). The City of Cape Town has developed Green Building guidelines that include the solar water heating bylaw with tax incentives. Eskom country wide rollout of subsidised solar water heaters

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	at lower interest rates. It is noted that there is an existing **Eskom rebate** in place which provides a cash rebate of between 20% and 30% for an approved installed solar water heater[13] (e.g. R4917 rebate on a 300L unit costing R16-R20,000 installed)	streamlining of current electrical certification system to reduce costs. • Further increases in the price of electricity to make solar water heating more competitive In the event of up-scaled takeup, then: • Sufficient funds must be available to sustain and possibly expand / increase the Eskom rebate scheme. • Sufficient manufacturers and trained, competent installers must be present in order to meet the increased demand. This could become a National Skills Priority for the National Skills Authority.	certification.[14] C. Industrial and commercial applications – costs will vary greatly			
Waste disposal and recycling	Recycling is discussed in detail in 1.3 above. This section looks at schemes to					Tshwane municipality charges ratepayers for the amount of waste collected thus

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	encourage individual houseowners and businesses to reduce waste. Some examples include: 1) "Pay-As-You-Throw" residential rate structures such as charging the same or more per additional bag of rubbish over a specified limit 2) Adopt incentives for businesses to increase recycling such as "curbside" recycling.					encouraging recycling
Waste water recycling[16]	This involves development of systems to encourage recycling and re-use of waste water, both grey water and sewerage (also refer to the prior section on biogas extraction). Re-use of water at residential, industrial and commercial sites, can potentially meet a large part of the demand for potable water, resulting in cost savings for the consumer and reduced demand on expensive treated water (noting the high energy costs of pumping and purifying water)[17] Municipalities can encourage use of waste water recycling by means of: ° increasing water tariffs in higher consumption brackets ° charging on a sliding scale, depending on the amount of water used ° providing financial incentives in the form of tax incentives, subsidies, grants or rates rebates for the water recycling				1) GREENCON Tel: O861 GreenCon Fax: (086) 637-4439 e-Mail:info@greencon.co.za 2) Biobox Southern Africa 0861-BIOBOX 0861-246269 Tel: 012 8037272 Fax: 012 8037273 *Email:* info@biobox.co.za	

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	systems, ° enforcing water recycling in certain applications (e.g. industry), ° more punitive methods of enforcing water restrictions using warnings and fines.					
Green building design	This involves development of a system to encourage the use of green building technologies on new buildings: ° Speedier approvals of green buildings ° Funding/ grants or cash incentives for those developers complying with green building guidelines ° Rates reductions for owners of green buildings	Clearly specified guidelines and related incentives. The Green Star SA certification system – recently introduced – may be useful in terms of developing guidelines: www.gbcsa.org.za/greenstar/ratingtools.php	Competent administrators to oversee the system.			The City of Tshwane has an incentive policy for green buildings. An environmentally friendly, upmarket apartment building has been built in District 6 in Cape Town.
4.2 Low income housing innovations	There are a range of important opportunities for the rollout and inclusion of better energy practices within low income housing (mainly that subsidized via the Department of Housing). These include: a) inclusion of solar water heaters for those with household water connections and in the case of those off grid, a small pv system, b) more attention to green design especially w.r.t house orientation to promote better thermal efficiency, c) use of greywater for fruit trees / homestead gardens etc					
5 AUTOMOBILES						
5.1 Tax/ rates rebates for small engine capacity	Most appropriately addressed at the national sphere of government.					
5.2	Most appropriately addressed at the					

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
Alternative fuels	national sphere of government.					
Biodiesel	CONTENTIOUS					
Ethanol	Information not available at the time of writing					
6 AGRICULTURE/ FOOD PRODUCTION						
6.1 Permaculture	Permaculture (from 'permanent agriculture') is ecologically sound food production that is also efficient and sustainable (www.botany.uwc.ac.za/EnvFacts/facts/permaculture.htm) Since the permaculture concept entails the use of available natural resources, it is affordable in even poor communities(www.trees.org.za/Permaculture/Food_&_Trees_for_Africa-4-15-0-0.html).	Proper planning and design to ensure appropriate relationships between different elements of the system eg. Water tanks above houses, gardens			**Permaculture Association of South Africa.** National Secretariat, PO Box 68929, Bryanston, 2021. Tel. 011-648 8819. Regional centres nationwide. **Centre for Low Input Agricultural Research and Development** (CLIARD). P/Bag X101, Kwa Dlangezwa, 3886. Tel. 0351-93911. **Institute of Natural Resources.** PO Box 375, Pietermaritzburg, 3200. Tel. 033 – 3460796 **Biodynamic Agricultural Association of South Africa.** PO Box 61, Camperdown, 3720. Tel. 033- 368317 (w) or 0325-51501 (h). Ask for Raymond Auerbach. **Farmers Support Group.** University of Natal, PO Box 375, Pietermaritzburg, 3200. Tel. 033-368385/6/7. **African Tree Centre.** PO Box 90, Plessislaer. Tel. 033-3984 220.	Kings school, Nottingham Road, KZN

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
					Valley Trust. PO Box 33, Bothas Hill, 3600. Tel. 031-777 1930. **Thloleko Learning Centre.** PO Box 1168, Rustenberg, 0300. Tel. 0142-25322. **Newlands Mashu Permaculture Learning Centre** **Food and Trees for Africa** Rivonia Gauteng Attn: Jeunesse Park ph: +27 (0)11 803-9750 fax: +27 (0)11 803-9604 / 6708	
Community Permaculture	Permaculture principles practiced by a focused and committed grouping of individuals living in the same village/farm/community. - typically small farm, eco village or group of home owners. Earth Care, Resource management and planning including, Zone areas, resource management (Water, Waste, Energy) and recycling, Seed saving. People care. A holistic life-style form of living generating minimal impact as a community and respect for environment and all life forms. Ecovillage Websites	Group commitment to similar values, Strong collective leadership.	Land, Access to some form of resources. Team of creative energies. Skills in Permaculture.			
6.2 Homestead gardens	Small gardens owned and grown by individual growers, either in peri urban or rural localities, and either on small plots as part of the homestead or on collective land but with individual plots for each grower. Several PPT projects have shown that providing training in organic food production, permaculture and general			Increased food security. Better household nutrition. Potential for sale or barter of excess produce. Platform for potential future income generating projects.		

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	agricultural principles combined with on site support and mentorship, greatly assists growers in improving their practices and the resultant yield from their gardens, not just in quantity but also the quality and diversity of crops / vegetables grown.					
Community Gardens:	Small collectives of existing grower groups (typically but not exclusively) Community Garden projects. Through various interventions and facilitation processes based on participative research, these groups are introduced to improved techniques of Organic sustainable Farming principles and concepts. Formal on-site training is then supported by a mentorship process. A supply of Tools and basic production equipment including seeds, compost and seedlings are distributed to assist the group gain a foothold and confidence with limited risk.	Established groups and individuals prepared to contribute and involve themselves daily in farming processes. Improved Skills transfer Initial or discounted means of production support. Mentorship processes. Belief by group in overcoming obstacles (eg No available water)	Skills transfer resources Production Materials discounted (access to seedlings, seed and Tools) Mentorship and support	Food security, income generating opportunities, local empowerment and Skills development	Newlands Mashu Permaculture Learning Centre,	Ubuhle Bhemvelo Womens Group (Esidweni) involved in Chilli production and bottling – Contact PPT – 031 3051288 Nhlazuka pepper growers – Contact PPT – 031 3051288
6.3 Fruit (and indigenous) tree establishment	Establishment of 1500 fruit/indigeous trees within 500 households in a targeted community		Approx R65,000 for a project including1500 trees, training and facilitation, project management, transport, fertiliser etc.	Food security, income generating opportunities, shade, sense of place, carbon sink, local empowerment and skills development	Newlands Mashu Permaculture Learning Centre, Trees for Africa	
6.4 Alternatives to pesticides	Information not available at the time of writing (although permaculture practices aim to eliminate the need for pesticides through methods such as the encouragement of naturally occuring pest predators)					
6.5 Composting	Information not available at the time of writing (although it is known that both organic and permaculture methods use only 'natural' methods such as composting					

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	to enhance soil nutrition)					
6.6 Water capture/ harvesting	Rainwater harvesting: 1) Infield rainwater harvesting (IRWH): a series of rainwater harvesting barriers and networks that prevent the run-off of water. 2) Ex field rainwater harvesting (ERWH): water is channelled to and stored in an area at some distance from the cultivation area, and then used to irrigate immediately or later. 3) Domestic rainwater harvesting (DRWH): storage tanks above or below the ground capture run-off from roofs, courtyards or cement surfaces.	Before decisions can be made about the best water management, it is important to understand: ° People's water and livelihood needs ° The types of water infrastructure that may meet these needs ° The maintenance requirements of these systems ° The water sources available in the area Community capacity-development in terms of understanding and maintaining systems is essential.				
6.7 Drip Irrigation	Drip irrigation minimises the use of water and fertiliser by allowing water to drip slowly to the roots of the plants. On the surface of the soil, micro-spray heads are used to dispense the water, usually for plants that have broad root systems (like vines). For crops planted in rows, subsoil drip irrigation is very effective, where water drips from pipes planted at or below the roots. This is particularly effective in areas where water is scare or where recycled water is used for irrigation. Liquid fertiliser is usually added to the	Before a decision can be made about the best type of drip irrigation system to install in a particular location, a careful study of the topography, soil conditions, water, crop and agroclimatic conditions must be conducted. Water quality, mismanagement and	Valves, pipes, tubing and emitters. It is strongly recommended that a filter – or a series of filters - be fitted as clogging is a common problem, especially when using recycled water. Funds to support	Most effective use of available water supply in areas where water is scarce. Suitable for use with recycled water, contributing to a more sustainable water-use system overall.	**Mikon Agri Services** **Tel:** +27 (013) 665 4050 **Fax:**+27 (013) 665 4045 **Email:** Email Mikon Agri Services **Website:** www.mikon.co.za	

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	water that is used in drip irrigation because traditional fertilisers are not adequately absorbed using this system.	maintenance problems are the most common limitations of this system, so proper planning to avoid these pitfalls is essential.	proper maintenance of the system, especially regular chemical treatment of the system, is essential.			
1.7 GREEN INFRASTRUCTURE ***Green infrastructure is the interconnected network of open spaces and natural areas, such as greenways, wetlands, parks, forest preserves and native plant vegetation, that naturally manages stormwater, reduces flooding risk and improves water quality. Green infrastructure usually costs less to install and maintain when compared to traditional forms of infrastructure. Green infrastructure projects also foster community cohesiveness by engaging all residents in the planning, planting and maintenance of the sites.***[18] *Note: Most of the information contained in this section was extracted from the website of Green Values http://greenvalues.cnt.org/green-infrastructure*						
7.1 Greenways	Greenways are privately or publicly owned corridors of open space which often follow natural land or water features and which are primarily managed to protect and enhance natural resources.			Trails along streambanks & greenways provide more surface area for natural absorption to lessen necessary sewer capacity. Trees slow down and clean water before it enters a stream or sewer. Additional benefits: increased tourism and opportunities for physical activity; increased property values.		
7.2 Rain-gardens	A rain garden is a man-made depression in the ground that is used as a landscape tool to improve water quality and reduce flooding. The rain garden forms a "bioretention area" by collecting water runoff and storing it, permitting it be filtered and slowly absorbed by the soil.			Rain gardens recharge groundwater sources, meaning that fewer pipes need to be installed to move water around the region. They help protect communities from flooding and drainage overflow and		

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
				provide valuable wildlife habitat. Additional benefit: costs less to maintain than traditional forms of landscaping.		
7.3 Wetlands restoration	Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season			In addition to capturing and slowing water and improving water quality, wetlands provide valuable wildlife habitat and recreational opportunities (hunting, fishing, bird watching).		
7.4 Trees	Entails the increased use of trees – preferably indigenous ones (typically in various urban strategic urban localities)			Tree windbreaks reduce residential heating and cooling costs by 10-50 percent. Trees reduce air pollution and there is increasing evidence that they play a role in reducing crime. Unlike sewers and built infrastructure, trees appreciate in value and require less maintenance as they age.		
7.5 Green roofs	Can include rooftop ponds or the use of lawn or other vegetation on roofs,			Depending on rain intensity and greenroof soil depths, runoff can be absorbed between 15 to 90 percent, thereby considerably reducing runoff and potential pollutants from traditional impervious	Resin Roof Tile Gary Reilly Cell Number: 083 613 1689 Head Office: 021 794 8117	

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
				roofing surfaces. Overall building energy costs can be reduced due to the greenroofs' natural thermal insulation properties— structures are cooler in summer and warmer in winter.		
7.6 Swales	A good method of passive water management. Swales are ditches dug on contour and used to sink water into the soil (www.seed.org.za/permaculture.php?articleId=31)			Swales typically have several advantages over conventional storm water management practice, such as storm sewer systems, including • the reduction of peak flows; • the removal of pollutants, • the promotion of runoff infiltration, and • lower capital costs.		
7.7 Porous pavement	Porous pavement is a permeable pavement surface with an underlying stone reservoir that temporarily stores surface runoff before infiltrating into the subsoil. This porous surface replaces traditional pavement, allowing parking lot runoff to infiltrate directly into the soil and receive water quality treatment. There are several pavement options, including porous asphalt, pervious concrete, and grass pavers. Porous asphalt and pervious concrete appear the same as traditional pavement from the surface, but are manufactured without "fine" materials, and incorporate void spaces to allow infiltration.			Reduces impervious areas, recharges groundwater (and streams), improves water quality, and eliminates the need for detention basins (homeowners and public water suppliers often rely on wells that tap groundwater - without recharge, the threat exists that these drinking water supplies could dry up rapidly).		

© Project Preparation Trust of KZN 2008. All Rights Reserved.

NAME	DESCRIPTION	PRE-CONDITIONS FOR SUCCESS	COSTS / RESOURCES REQUIRED	SUSTAINABLE ADVANTAGES	KNOWN SERVICE PROVIDERS	PROJECT EXAMPLES
	Grass pavers are concrete interlocking blocks or synthetic fibrous grid systems with open areas designed to allow grass to grow within the void areas. Other alternative paving surfaces can help reduce the runoff from paved areas but do not incorporate the stone trench for temporary storage below the pavement (see the Green Parking Fact Sheet). While porous pavement has the potential to be a highly effective treatment practice, maintenance has been a concern in past applications of the practice (http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool6_Stormwater_Practices/Infiltration%20Practice/Porous%20Pavement.htm)					
7.8 Native landscaping	Increased use of native plants in landscaping			Native landscaping attracts a variety of birds, butterflies and other animals, supporting biodiversity. Once established, native plants do not need fertilizers, herbicides, pesticides or watering, thus benefiting the environment and reducing maintenance costs.		

© Project Preparation Trust of KZN 2008. All Rights Reserved.