Foundations for Sustainable
Rural and Peri-Urban Development

1st August 2012

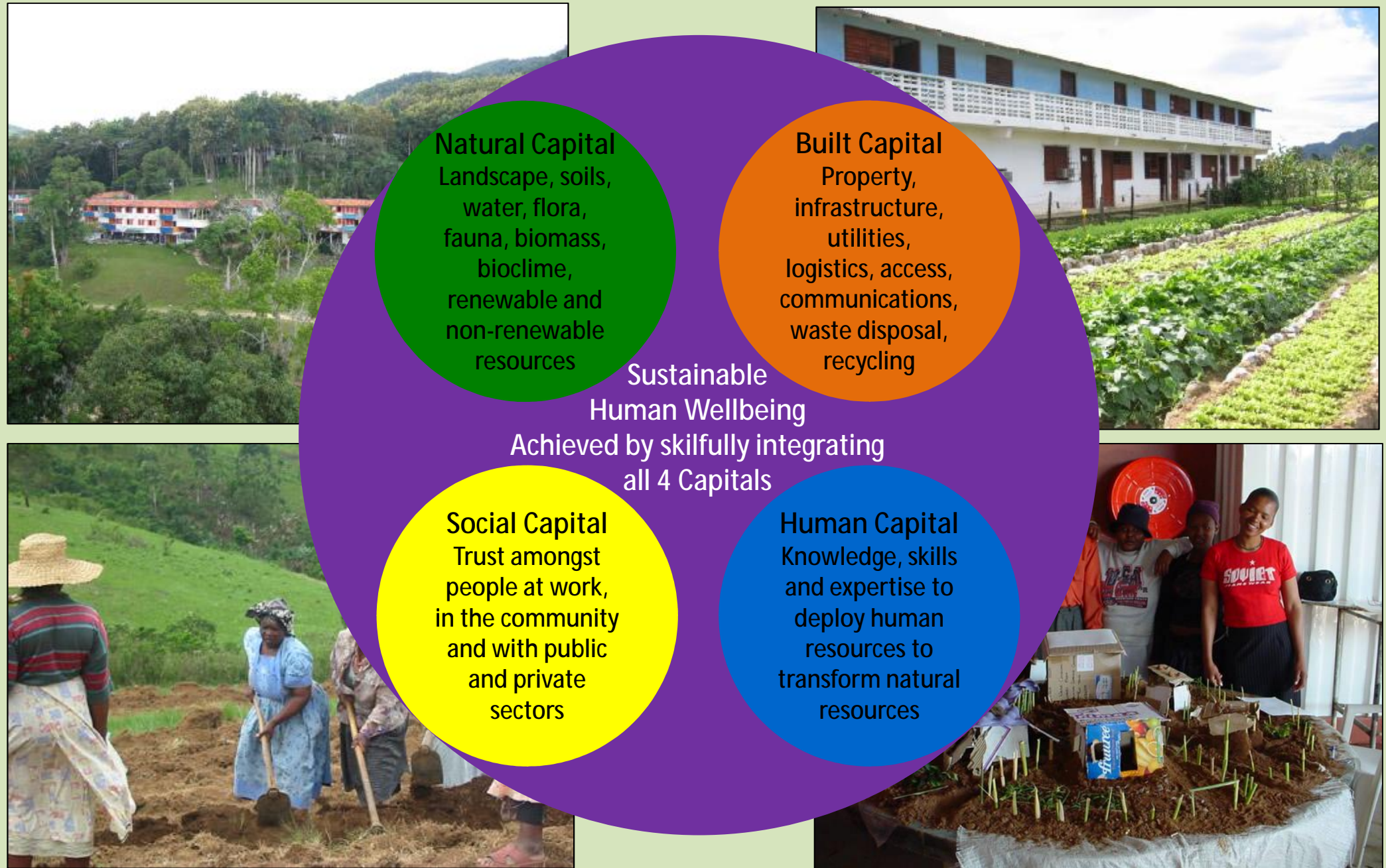## Contents

Prepared by
Permaculture2012 Network
www.permaculture2012.co.za
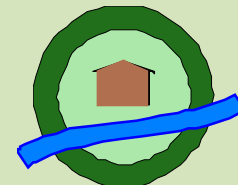
Contact: Ezio Gori
Cell: 083 300 2385, Email: whatabuz@iafrica.com

1. The 4 Capitals

Natural Capital
Landscape, soils, water, flora, fauna, biomass, bioclime, renewable and non-renewable resources

Built Capital
Property, infrastructure, utilities, logistics, access, communications, waste disposal, recycling

Sustainable Human Wellbeing
Achieved by skilfully integrating all 4 Capitals

Social Capital
Trust amongst people at work, in the community and with public and private sectors

Human Capital
Knowledge, skills and expertise to deploy human resources to transform natural resources

2. Natural Capital

Sustainable Agricultural Landscapes harness the natural forms and patterns of the land, albeit with minor landscape surgery to harvest rainwater, thus creating productive landscapes.

It is essential to read the landscape correctly and conceptualize plans that have a minimal disruption on the natural environment whilst simultaneously harnessing the form and shape of the landscape to maximize the benefit for development, especially with respect to rainwater harvesting and soil improvements.
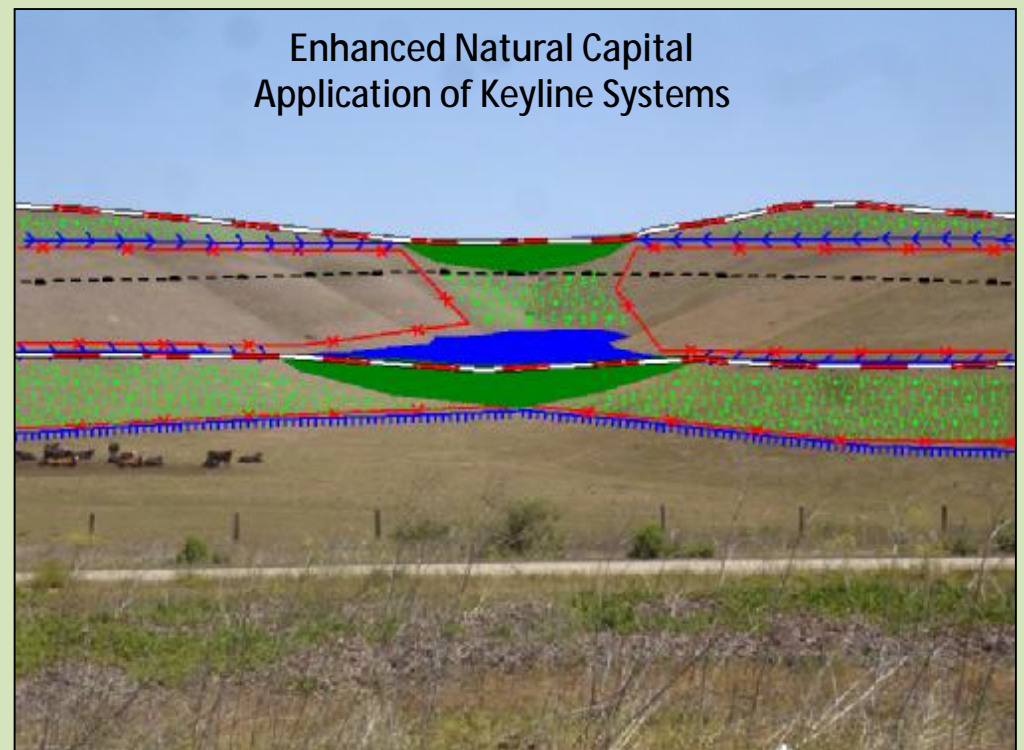

Undeveloped Natural Capital

Enhanced Natural Capital
Application of Keyline Systems

(Photos from Darren Doherty)

2. Natural Capital

On average, 70% of water consumption worldwide is used for irrigation of crops, which is clearly unsustainable in a water scarce environment, hence the need for low tech rainwater harvesting systems.

The benefits of swales on contour planted with vetiver grass and acacia albida trees, or similar;-
- promotes rainwater harvesting
- re-charges water tables
- reduces need for irrigation
- mitigates against soil erosion
- provides windbreaks that reduces wind burn and creates beneficial micro-climates
- draws up vital minerals for plant use
- improves biodiversity
- contributes to biomass that mitigate against Climate Change.
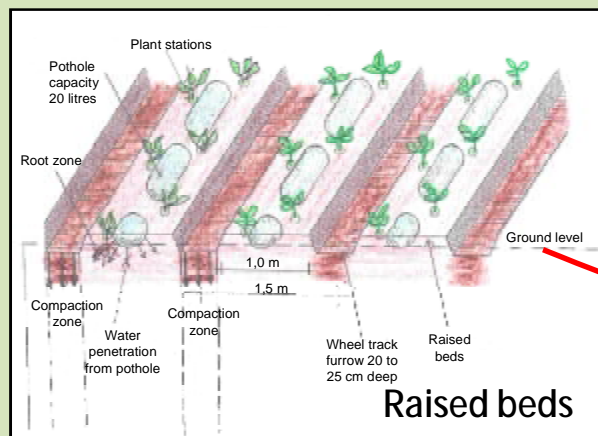
The benefits of raised beds prepared with a ridge-bed-maker;-
- promotes limited till agriculture with minimal soil compaction
- reduces need for heavy plant and equipment
- reduces need for irrigation
- enhances drainage from excessive stormwater
- establishes raised beds requiring minimal maintenance and with improvements in soil fertility.

The combination of swales and raised beds can reduce irrigation needs by up to 50% and improve crop yields by up to 30% to 40%.

Types of swales

Raised beds

Use of swales on terrain
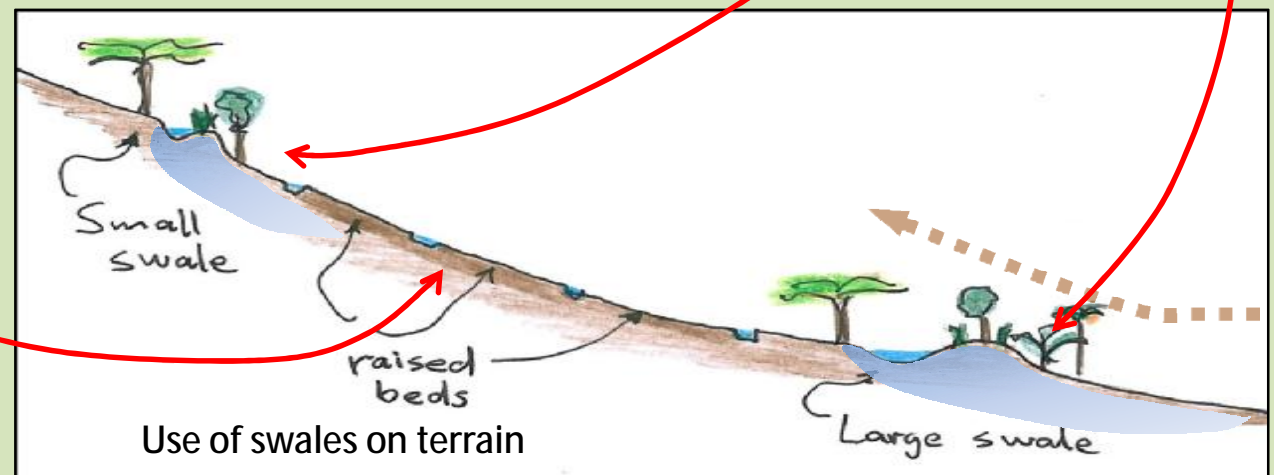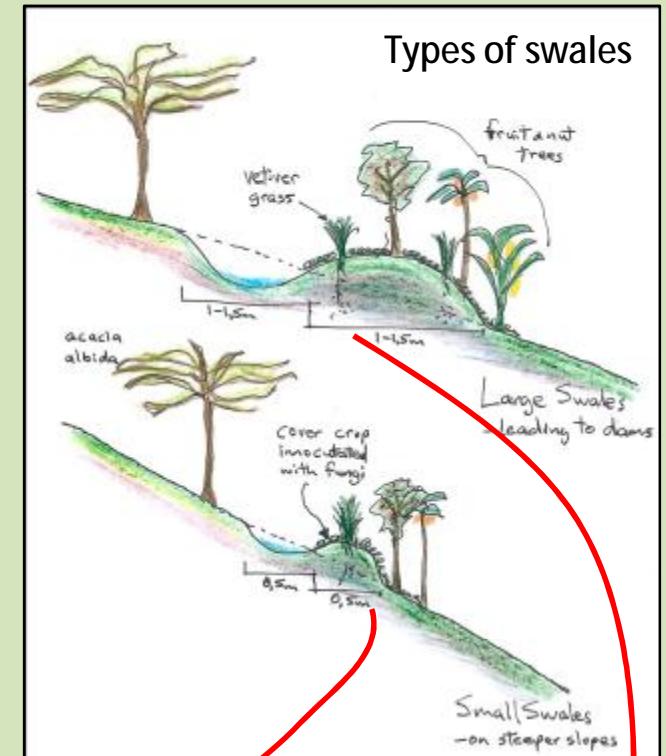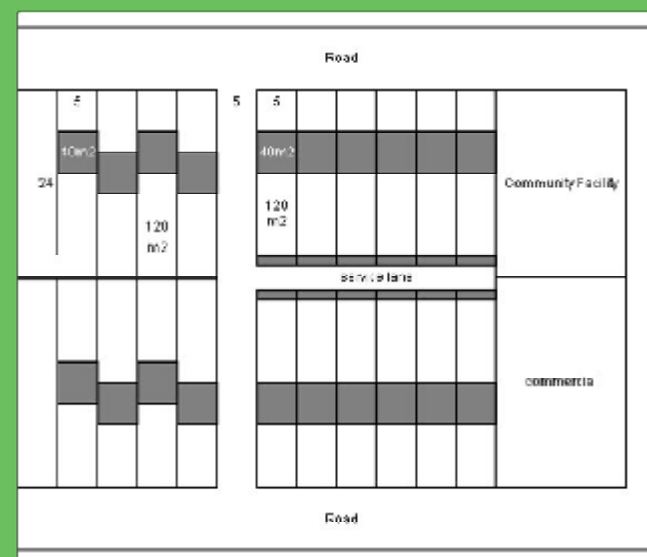
3. Built Capital

The significant problems we have cannot be solved at the same level of thinking with which we created them (Albert Einstein).

The Current Reality
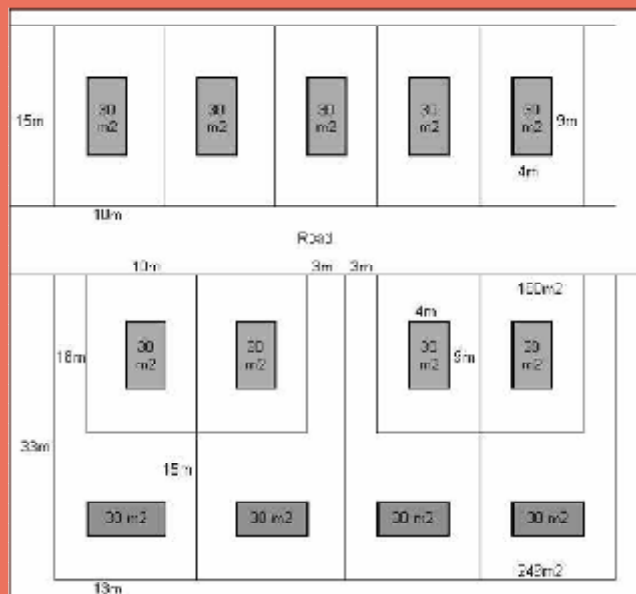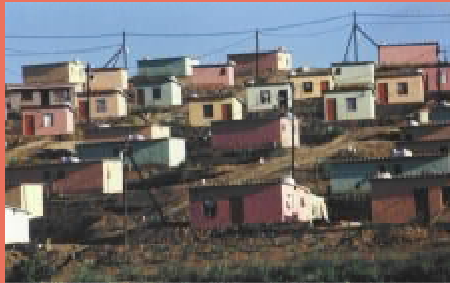
- higher servicing cost
- less housing residual
- less privacy
- less functional space
- predominantly on steeper land
- lower densities
- unsafe neighbourhoods
- lower economic thresholds
- higher energy use
- smaller houses (30m2)

The Sustainable Design Opportunity

- lower servicing cost
- more housing residual
- more privacy
- more functional space
- predominantly on flatter land
- higher densities
- safe neighbourhoods
- higher economic thresholds
- lower energy use
- larger houses (40m2)

www.permaculture2012.co.za
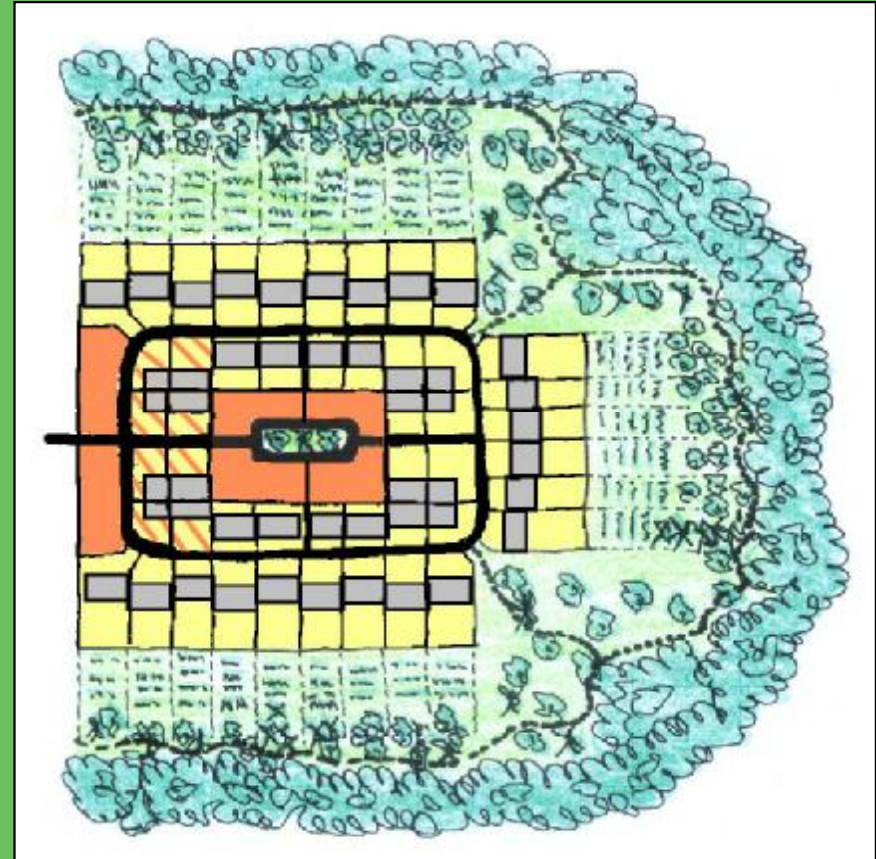
3. Built Capital

Same housing yield, but different form with multiple functions, thus creating a sustainable housing environment.

Typical conventional greenfield housing layout
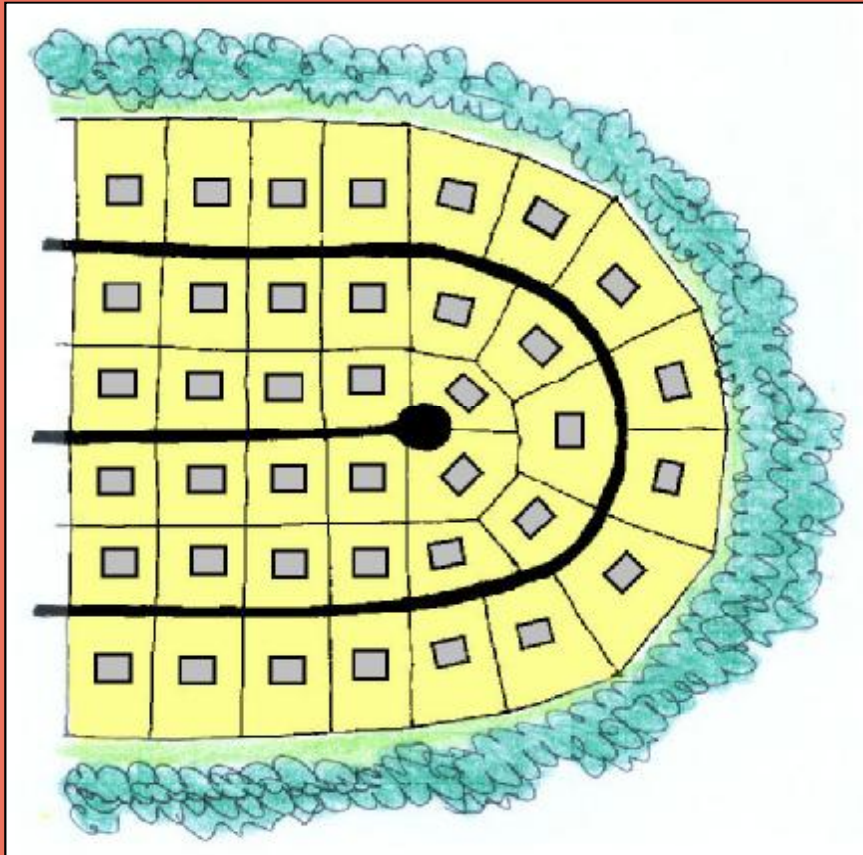
A sterile, unhealthy, unsafe, mono-culture built environment that subdues community spirit and forms a barrier to the natural environment.

Compact row housing layout within a sustainable environment

A vibrant, diverse and safe built environment that promotes a sense of community, urban agriculture and an appreciation of the natural environment.

4. Human Capital

Investment in Human Capital through skills training and practice are essential in order to empower individuals to take responsibility for their own needs and thus enhance self sufficiency in lieu of creating dependence on a welfare handout system. Support systems that provide on going training, mentoring and business linkages are vital to support newly empowered individuals in their early years of striving towards self sufficiency.

www.permaculture2012.co.za

5. Social Capital

Investment in Human Capital stimulates the development of Social Capital wherein the Community is empowered to take responsibility for their own collective actions, thereby improving social cohesion, and thus facilitating the general upliftment of the whole Community.
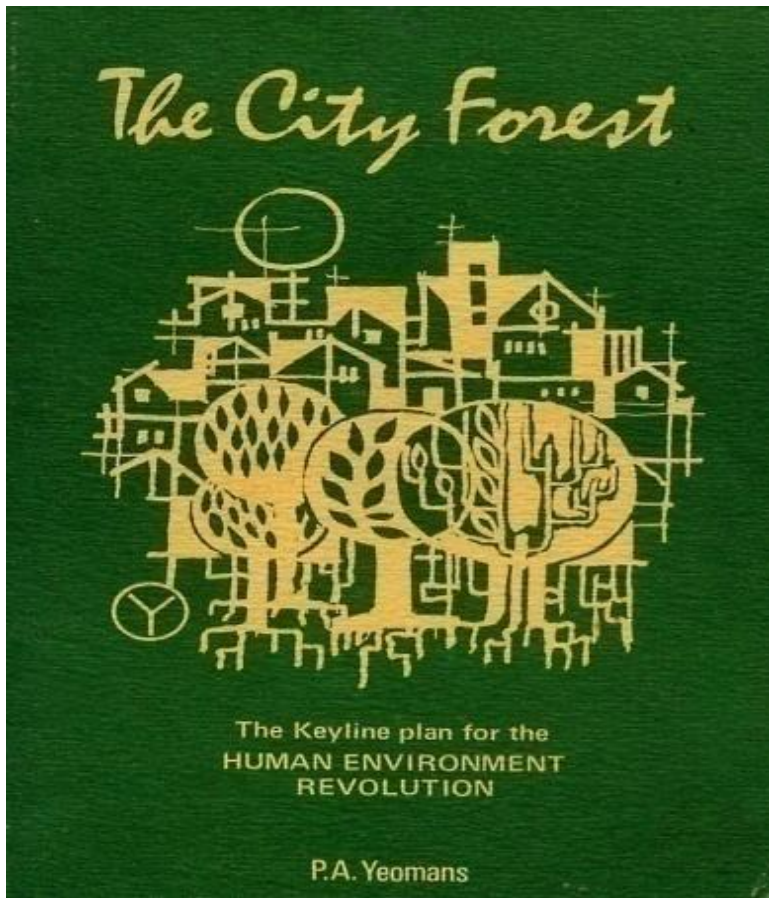
This Social Capital is promoted by relocalising the economy in order to avoid the "leaky bucket" syndrome associated with the global economy. In other words, the relocalised economy promotes closed loop systems wherein the exchange of goods and services are retained within the local economy instead of being bled externally to the global economy, thus creating local employment and retaining income and savings within the Community.

6. Design Integration

Yobarnie Farm (Australia), approximately 180 ha, average rainfall is 350mm pa. With Keyline design there is enough water for 1200 Households each using 500kl pa, and, with complete on-site ecological sewage and waste water treatment.

Yeomans Keyline system and scale of permanence dictates the process of planning and design priorities, namely, water, access, forestry, buildings, boundaries and soils. Inspired by "The City Forest" by P.A. Yeomans. (Photos from Darren Doherty)

The City Forest

The Keyline plan for the
HUMAN ENVIRONMENT
REVOLUTION

P.A. Yeomans

www.permaculture2012.co.za

6. Design Integration

Fundamentals for Ecovillage Developments
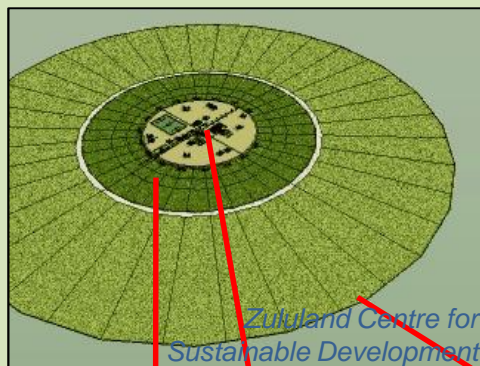

Findhorn

Natural Building Systems

- Low emery footprint
- Low maintenance costs
- Use of local materials
- Vernacular design

Renewable Energy

- Wind power
- Solar power
- Biogas
- Biomass

Findhorn

Zululand Centre for Sustainable Development

Zululand Centre for Sustainable Development

Zululand Centre for Sustainable Development

Zululand Centre for Sustainable Development

Socio-Economic Fabric

- Local employment opportunities
- Community facilities
- Educational facilities
- Local shopping facilities
- Local currency

Holistic Permaculture Design

to produce a vibrant, diverse and safe built environment that promotes a sense of community, urban agriculture and an appreciation of the natural environment.

Findhorn

Food Security

- Organic farming
- Local food security
- Edible landscapes
- Community Supported Agriculture

Ecological Water & Sanitation

- Constructed wetlands, and/or,
- Living machines
- Re-cycle grey water for irrigation
- Rainwater harvesting

Findhorn

www.permaculture2012.co.za

10

6. Design Integration

First Priority -
Homestead Gardens to
enhance Food Security
Food security is to be
enhanced by maximizing the
land use intensity around
homesteads. Grey water
should also be recycled into
sand / gravel filters for
feeding to vegetable beds
and trees / orchards.
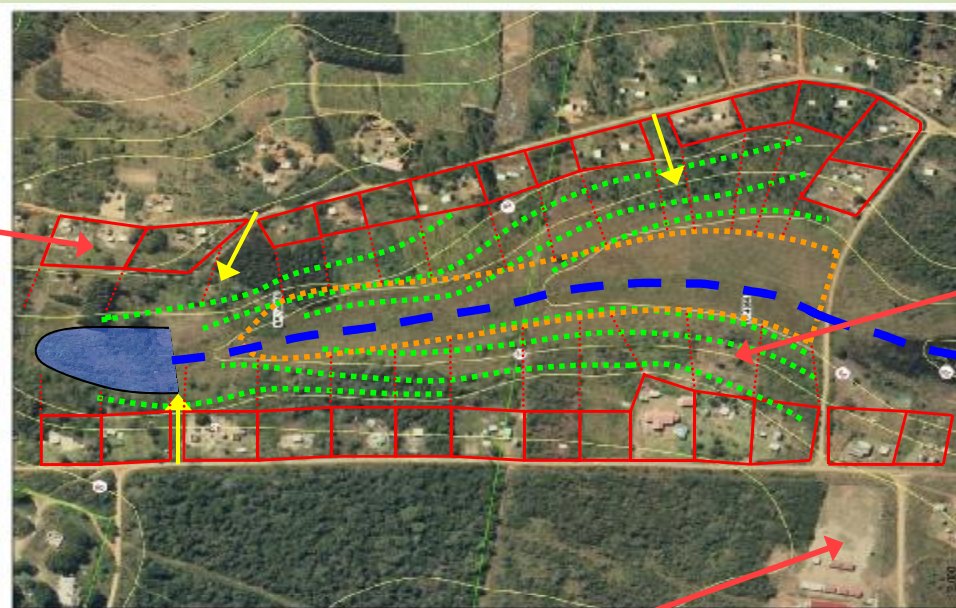
Third Priority – Farmers Co-operative / Support Centre – Agri-Hub
This Centre should become the hub of the local farming and other SME activity.
The Centre should also showcase some demonstration gardens and
Permaculture examples; establish a plant nursery and seed bank; provide
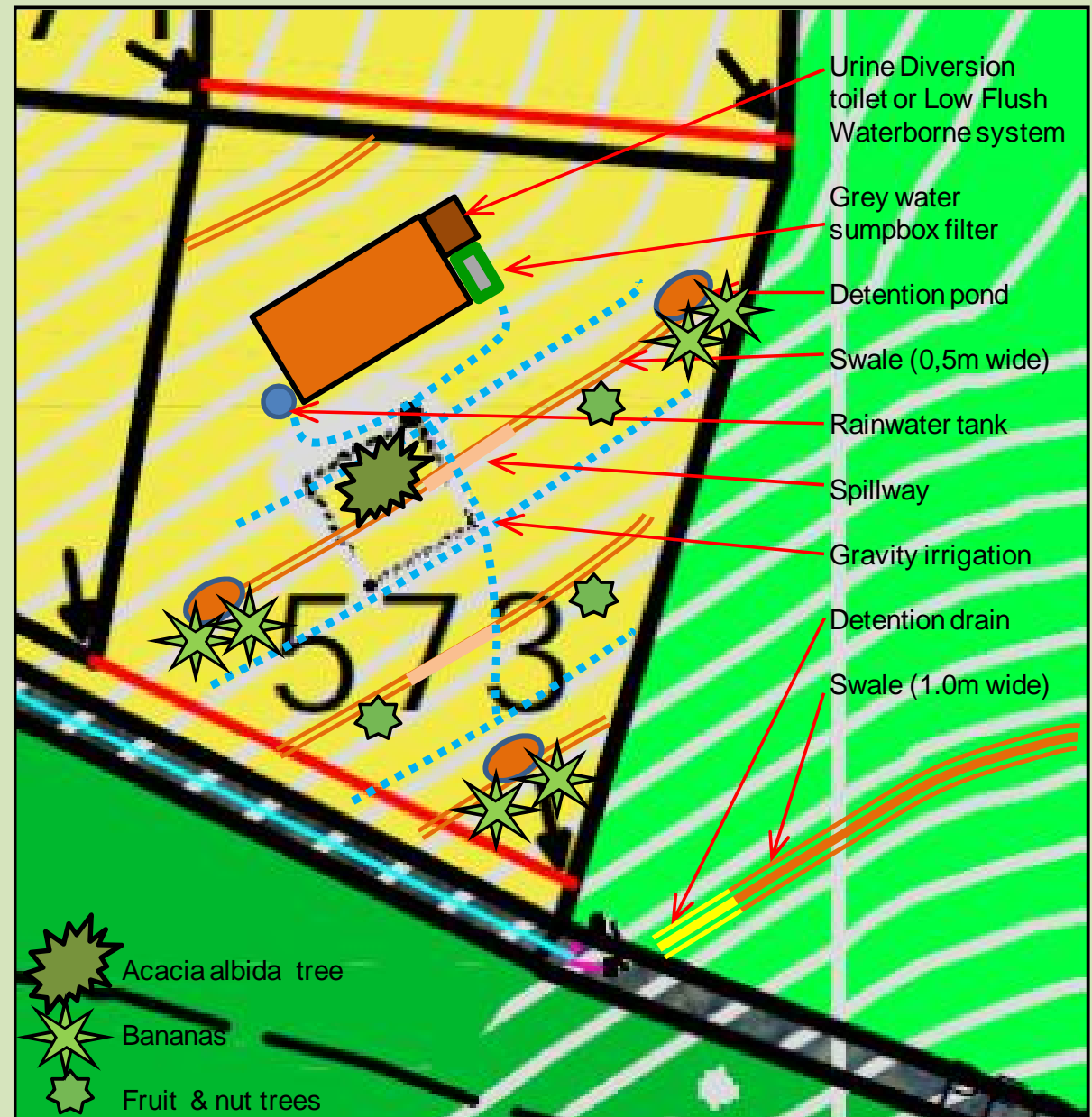agricultural support services; and, provide some traders stalls for market days.
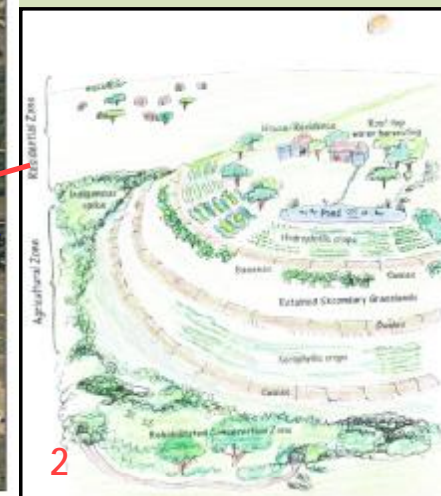
Second Priority - Development of
Productive Commonage for additional
Food Security and Commercial Cash Crops
Establish Keyline Systems for irrigation of both
commonage and homesteads Establish crop lands
and orchards with niche products, such as, organic
certified crops, essential oils, fruit and nut trees.
Integrate large scale rainwater harvesting systems
with the keyline system for commonage areas and
enhance irrigation to homestead gardens   Use
Limited Till systems that avoid costly heavy
machinery that compresses the soil and reduces
fertility. Deploy Organic farming systems that
avoid the use of chemical fertilizers and toxic
pesticides that damages the environment.

www.permaculture2012.co.za

6. Design Integration

Homestead Gardens to enhance Food Security - One Homestead One Garden

A food security intervention to mitigate spiralling food prices; growing healthy and nutritious organic food; composting organic waste; recycling grey water for garden irrigation; and, rainwater harvesting to offset the cost of irrigation.

Urine Diversion toilet or Low Flush Waterborne system

Grey water sumpbox filter

Detention pond

Swale (0,5m wide)

Rainwater tank

Spillway

Gravity irrigation

Detention drain

Swale (1.0m wide)

Acacia albida tree

Bananas

Fruit & nut trees

6. Design Integration

**Farmers Co-operative / Support Centre
(as per the Umbumbulu Agri-Hub Model)**
Small scale farmers are far more productive than large scale commercial farmers, but, small scale farmers need initial logistical support to grow surplus crops which can feed a growing demand in good quality organic food for the local market.

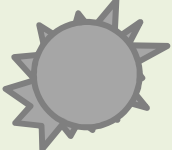

Vegetable Box Scheme

The Agri-Hub Model provides local farmers with services ranging from;- training and mentorship; access to development programmes to enhance the productive capacity of their land; logistical support; packaging of surplus produce; access to markets; and, participatory organic certification process, which all contribute to the economic welfare of local farmers.

www.permaculture2012.co.za

13

7. Design Process

A thorough and holistic Design Process that continually refines the overall sustainability of a project

1. Site Analysis	2. Concept Design	3. Detail Design	4. Implementation	5. Operate
Status quo assessment:- Land history, local ordinances, surrounding neighbourhood, traffic, utility services, site access, local resources. Physical attributes:- Building structures, trees, hedges, topography, water flows, energy flows, view sheds. Local biological health:- Native species and their health, intended uses, chemical and biological soil analysis. Local climate:- Sun exposure, sun angles, rainfall, temperature ranges, wind intensity and direction, microclimates, thermal masses. *Output: Base Plan*	Overall long-term vision:- 50 year+ horizon, robust sustainable framework, flexibility and adaption to changes. Zone, elevation and sector plan:- Yeoman's scale of permanence - keyline rainwater harvesting; water recycling; roadways, forest areas, buildings, boundaries, soils; sectors for wind, sun, fire, water and wild animals; and, plan for zones 1 to 5. Natural flows and patterns:- Geomancy, biomimic natural flows, flow forms, microclimates, harvest natural energies. "Wild design":- Incorporate at least one wild idea. *Output: Concept Plan*	Refine concept ideas:- Create the design framework and locate the major design fixes. Refine flows and patterns:- Delineate flows and patterns and incorporate within the design framework. Micro-design elements:- Multiple functions, natural energy systems, biological resources. Integrate all design elements:- Create a master layout plan with all design details in accordance with milestone phases. *Output: Design Plan*	Resource specification:- Organisational structure, roles and responsibilities, manpower requirements, technical specifications for structures and landscaping, plant lists, seeds, biological resources. Budget estimate:- Schedule of quantities, pricing, taxes, total budget. Gantt chart:- Work breakdown structure, activity scheduling, resource distributions. Commit resources:- Secure budget, contractual arrangements, procurement, brief and deploy work teams, site supervision. *Output: Programme & Budget*	Maintenance:- Manage the evolution of the master layout design plan, manage planned successions, manage biological resources, co-ordinate work teams, harmonise project beneficiaries, and, financial control. Evaluate:- Continual SWOT analysis of maintenance activities. Tweaking:- Design and implement enhancements. *Output: Monitor & Evaluate*

8. Permaculture2012 Network

Permaculture2012 Network is a team of dedicated development professionals with a wide range of skills and experience that compliment each other to deliver projects that are sustainable and that empower people towards realising their potential.

Project Team Member	Core Skills
Ezio Gori	Project management and development planning.
Walter Coughlan	Project management and marketing.
Paula Osborne	Marketing, logistical planning and information technology.
Gabriel Mngoma	Training and mentoring.
Ewald Viljoen	Training and mentoring.
Riaan Botes	Development planning & GIS.
Gavin Eichler	Project management and community development.

www.permaculture2012.co.za