

https://dspace.org/

A growing city: agriculture and food security in the growing urban context

Tarboton, Ian

2013-08-02
http://hdl.handle.net/10539/12970

Downloaded from a DSpace repository. https://dspace.org/

References

Books and Journals

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., Angel, S., (1977). A Pattern Language: Towns, Buildings, Construction. New York: Oxford University Press. Pp 115, 119, 247, 257-258, 487, 493, 506, 522, 576-577, 606-607, 697, 755, 762, 786-787, 792, 795-796, 800, 811, 814, 819, 823, 825, 945

Beavon, K. (2004). Johannesburg: The Making and Shaping of the City. Pretoria: University of South Africa Press. P 50

Benyus, J., (1997). Biomimicry: Innovation Inspired by Nature. New York: Harper Perennial. Pp 1-7, 9, 12-13, 19-20, 22, 24, 26, 38-39, 46-47

Buchanan, P., (2005). The Ten Shades of Green: Architecture and the Natural World. New York: The Architectural League of New York

Chan, Y., (2007). Contemporary Design in Detail: Sustainable Environments. Beverly: Rockport

Ching, F., (2008). Building Construction Illustrated, Fourth Edition. New Jersey: John Wiley & Sons

Cumberlidge, C. and Musgrave, L., (2007). Design and Landscape for People. London: Thames and Hudson. Pp 8, 11, 174, 182, 183

Dow, K. and Downing, T., (2006). The Atlas of Climate Change: Mapping the World's Greatest Challenge. London: Earthscan. Pp 50, 58, 84

Dr. Seuss, (1971). The Lorax. New York: Random house Inc.

Flannery, T., (2009). Now or Never. New York: Atlantic Monthly Press. Pp 3, 50, 116

Guzowski, M., (2010). Towards Zero Energy Architecture: New Solar Design. London: Laurence King

Harris, J. R. & Todaro, M. P., (1970). Migration, Unemployment and Development: A Two-Sector Analysis. American Economic Review, 60, 1, 126-142.

Killory, C. and Davids, R., (2007). As Built: Details in Contemporary Architecture. New York: Princeton

Mollison, B., (1988). Permaculture: A Designer's Manual. Tasmania: Tagari. Pp 15, 19, 36, 55, 70, 78-79, 138-139, 149-150, 174-175, 185

Pawlyn, M., (2011). Biomimicry. In Yeang, K. (ed.), *Green Design.* London: Black Dog Publishing. Pp 34, 36, 37, 39

Rukini, M., (2011). Traditional Agriculture: How Can Productivity Be Improved. In Moeletsi, M. (ed.). Advocates for Change: How to Overcome Africa's Challenges. Johannesburg: Picador Africa. Pp 207-214, 217, 218, 225, 227, 228, 230

Self, P., (1957). Cities in Flood: Problems of Urban Growth. London: Faber and Faber. Pp 20, 28-29, 31, 49, 52, 114

Selhub, E. and Logan, A., (2012). Your Brain on Nature. Ontario: Wiley. Pp 3, 5, 8-9, 11, 19-21, 25, 27, 44, 55, 57-58, 61, 67, 83, 86, 88, 92, 102-103

Smith, D., (2010). Is There an Ecological Unconscious? New York Times Sunday Magazine. P36

Van Lengen, J., (2008). The Barefoot Architect: A Handbook for Green Building. California: Shelter Publications

Wells, M., Timmer, F., and Carr, A. (2011). Understanding Drivers and Setting Targets for Biodiversity in Urban Green Design. In Yeang, K. (ed.), *Green Design.* London: Black Dog Publishing. Pp 14-16

Electronic Sources

Altman, M., Hart, T., and Jacobs, P., (2009). Food Security in South Africa. South Africa: HSRC. Pp 7-9, 11, 16, 19, 23, 24

Annemarie Loots and City of Johannesburg, (2009). Johannesburg Southern Inner City Belt Urban Development Framework. South Africa. Pp 5-7, 21, 25, 35

Bonti-Ankomah, S., (2001). Addressing Food Security in South Africa. South Africa. Pp 2, 3, 6, 11-17

Cornwell, K. and Inder, B., (2004). Migration and Unemployment in South Africa: When Motivation Surpasses the Theory. Clayton, Victoria, Australia. Pp 2-4, 15

Shayler, H., McBride, M., and Harrison, E., (2009). Sources and Impacts of Contaminants in Soils. New York, USA: Cornell Waste Management Institute. Pp 1, 3-5

SMIT (2010). Solar Ivy. Retrieved online on August 11, 2011, from SMIT: http://solarivy.com/solarIvy_productSheet_062211.pdf

Statistics South Africa, (2011). Mid-year Population estimates, 2011. Pretoria, South Africa. Pp 2, 5, 13

Thiyagarajan, G., Umadevi, R., and Ramesh, K., (2007). Hydroponics. in Science Tech Entrepreneur. Pp 1, 2

Zipper, C., Skousen, J., and Jage, C., (2011). Passive Treatment of Acid Mine Drainage. Virginia, USA: Virginia Cooperative Extension. Pp 3-5

Web Sites

All Green To Me, (2009). Boosting Yields, Testing the Environment. Retrieved September 25, 2012, from All Green To Me: http://php.delawareonline.com/blog/allgreentome/labels/pesticides.html

Apartment Therapy, (2012). Living Machine Systems by Worrel Water Technologies. Retrieved October 19, 2012, from Apartment therapy: www.apartmenttherapy.com

Aquaponic Gardening, (2011). Aquaponic Gardening - Get Hooked! Retrieved September 26, 2012, from Aquaponic Gardening: aquaponic-gardening.blogspot.com

Aquaponics Backyard, (2012). Aquaponics Systems. Retrieved September 26, 2012, from Aquaponics Backyard: aquaponicsbackyard101.blogspot.com/2012/07/aquaponic-systems

Architecture Exposed, (2011). Coral Reef, Matrix and Plug-in for 1000 Passive Houses. Retrieved June 07, 2012, from Architecture Exposed: www.architectureexposed.com

Artissimo's Soup, (2012). April 15. Retrieved October 01, 2012, from Artissimo's Soup: artissimo.soup.io

Biomimicry Institute, (2011). Solution-based and Problem-based Approaches. Retrieved September 26, 2012, from Biology to Design: www.biologytodesign.com

Biomimicry Institute, (2012). AskNature. www.asknature.org

City Farmer News, (2009). Illinois Policy Makers Take Urban Agriculture Tour. Retrieved September 26, 2012, from City Farmer News: www.cityfarmer.info

City of Johannesburg, (2012). Johannesburg Development Agency. Retrieved April 11, 2012, from City of Johannesburg: www.joburg.org.za

Climatemps, (2012). Johannesburg. Retrieved September 12, 2012, from Climatemps: www.johannesburg.climatemps.com

De Smit, D., (2010). Hoping for Despair? Despairing for Hope? Retrieved November 02, 2012, from Romancing Resilience: http://romancingresilence.wordpress.com

Design Buzz, (2011). Coral Reef Matrix to Rehabilitate Victims of Haiti Earthquake. Retrieved June 07, 2012, from Design Buzz: www.designbuzz.com

Drug Rehabilitation Today, (2010). Eco-Psychological Addiction Treatment. Retrieved September 26, 2012, from Drug Rehabilitation Today: www.drugrehabilitationtoday.com

Dunn, C., (2008). Whale Power: More Efficient Fan Blades Mimic Humpback Fins. Retrieved October 22, 2012, from Treehugger: www.treehugger.com

Ecofriend, (2008). Living Machine: Nature Helps OUt Big Time in Hydro Clean Up! Retrieved October 23, 2012, from Ecofriend: www.ecofriend.com

Ecological Observations in Singapore, (2012). Fig Tree and Fig Wasp = Babysitter and Matchmaker. Retrieved June 27, 2012, from Blog.nus: http://blog.nus.edu.sg

FAO. (2012). Dynamics of Change: The Dividends of Food Security. Retrieved March 20, 2012, from Food and Agriculture Organization: www.fao.org

FAO, 2012. SEAGA Socio-Economic and Gender Analysis for Emergency and Rehabilitation. Retrieved September 25, 2012, from FAO: www.fao.org

Firstpost, (2012). Budget 2012: Big Gains for fertiliser cos But Investors Unimpressed. Retrieved September 25, 2012, from Firstpost: www.firstpost.com

Foreman, P., (2012). Buildings and Nature. Retrieved September 26, 2012, from Mind Map Art: www.mindmapart.com

Funkey Doodle Donkey, (2011). Taxi Lingo. Retrieved September 25, 2012, from Funky Doodle Donkey: funkydoodledonkey.blogspot.com

Geiger, O., (2011). Hempcrete Blocks. Retrieved November 02, 2012, from Geopolymer House Blog: http://geopolymerhouses.wordpress.com

Georgieva, Y., (2012). Plantscrapers. Retrieved October 21, 2012, from Landarchs: landarchs.com

Global Post, (2012). Johannesburg Police on Guard for New Year's Eve Appliance-tossing Tradition. Retrieved September 25, 2012, from Global Post: www.globalpost.com

Google Maps, (2012). Johannesburg. Retrieved September 25, 2012, from Google Maps: maps.google.co.za

Greater Johannesburg, (1999). An Analysis of Pollution in Greater Johannesburg. Retrieved September 26, 2012, from Greater Johannesburg: http://ceroi.net/reports/johannesburg/csoe/html/nonjava/Pollution/Total%20Pollution/analysis-poll.htm

Greater Johannesburg. (2000). State of Poverty. Retrieved February 23, 2012, from Greater Johannesburg: http://ceroi.net/reports/johannesburg/csoe/Default.htm

Greater Johannesburg. (2000). State of Soil. Retrieved October 23, 2012, from Greater Johannesburg: http://ceroi.net/reports/johannesburg/csoe/Default.htm

Hunger Notes, (2012). 2012 World Hunger and Poverty Facts and Statistics. Retrieved April 04, 2012, from Hunger

Notes: www.worldhunger.org

Hydroponics Systems, (2011). Equipments & Supplies for NFT Hydroponics Systems. Retrieved April 14, 2012, from Hydroponics Systems: www.hydroponicssystems.co

Idea Champions, (2012). The Heart of Innovation. Retrieved September 25, 2012, from Idea Champions: www.ideachampions.com

Inhabitat, (2012). Plantagon Breaks Ground on its First 'Plantscraper' Vertical Farm in Sweden. Retrieved April 06, 2012, from Inhabitat: www.inhabitat.com

Inner-City Gazette, (2011). Joubert Park Clinic Food Garden A Success. Retrieved April 06, 2012, from Inner-City Gazette: www.inner-city-gazette.co.za

JDA, (2012). Faraday Project. Retrieved April 11, 2012, from JDA: www.jda.org.za

John, L., (2012). Stress, the Nervous System and Natural Healing. Retrieved September 26, 2012, from Dominica News Online: www.dominicanewsonline.com

Living Machine, (2012). Living Machine Technology. Retrieved October 22, 2012, from Living Machine: www.livingmachines.com

Melville Koppies Nature Reserve, (2012). Melville Koppies: Trekkers, Farmers and Miners. Retrieved September 25, 2012, from Melville Koppies Nature Reserve: www.dogwalk.co.za

Meredith, A., (2011). Biomimicry - The "New Science" of the Divine Feminine. Retrieved September 26, 2012, from Anna Meredith's Blog: www.floweressencedeva.com

National Park Service, (2007). Monitoring Program Overview. Retrieved September 26, 2012, from national Park Service: http://science.nature.nps.gov/im/units/GLKN/monitoring.cfm

News Interior Design, (2010). Benefits of Using Green Plants in Home Interior. Retrieved September 26, 2012, from News Interior Design: www.newsinteriordesign.com

Oppenheim, L., (2008). Lessons in Biomimicry - Part 2 Natural Systems. Retrieved October 21, 2012, from Trehugger: www.treehugger.com

Orru, A., (2012). Sustainability Consultancy. Retrieved September 26, 2012, from Anna Maria Orru: www.annamariaorru.com

Permaculture and Sustainability, (2011). The Classroom as Permaculture. Retrieved April 14, 2012, from Permaculture and Sustainability: www.permaculturesschool.blogspot.com

Permaculture SA, (2012). What is Permaculture. Retrieved April 06, 2012, from Permaculture South Africa: www.permaculturesouthafrica.com

Population Reference Bureau, (2012). Human Population: Urbanization. Retrieved February 23, 2012, from Population Reference Bureau: www.prb.org

Population Reference Bureau, (2007). World Population Highlights 2007: Urbanization. Retrieved February 23, 2012, from Population Reference Bureau: www.prb.org

Principia Cybernetic Web, (1997). Feedback. Retrieved September 27, 2012, from Principia Cybernetica Web: pespmc1.vub.ac.be/FEEDBACK

Ratcliff, T., (2011). Abandoned Fake Disneyland in China. Retrieved September 27, 2012, from Google Plus: plus.google.com

Robbins, J., (2012). Why Trees Matter. Retrieved June 20, 2012, from New York Times: www.nytimes.com

Rogers, C., (2010). Information on Soil Pollution. Retrieved October 05, 2012, from Livestrong.com: www.livestrong.com

Roseman, B., (2011). Farms Take Root in Inner Cities. Retrieved October 21, 2012, from USA Today: mediagallery.usatoday.com

Science Daily, (2010). Punishment Important in Plant-Pollinator Relationship. Retrieved October 22, 2012, from Science Daily: www.sciencedaily.com

Siyakhana, (2011). A Model Food Garden. Retrieved April 06, 2012, from Siyakhana: www.siyakhana.org

Siyakhana, (2011). The Siyakhana Initiative for Ecological Health and Food Security. Retrieved April 06, 2012, from Siyakhana: www.siyakhana.org

Solar Ivy, (2012). The Idea. Retrieved October 22, 2012, from Solar Ivy: www.solarivy.com

South Africa for Dummies, (unknown). Unknown. Retrieved September 25, 2012, from South Africa for Dummies: www.southafrica-for-dummies.com

South Africa Magazine, (2011). Pikitup Strike Ends. Retrieved September 25, 2012, from South Africa Magazine: www.southafricamag.com

SouthAfrica.info. (2012). Gauteng province, South Africa. Retrieved May 14, 2012, from SouthAfrica.info: www.southafrica.info

SouthAfrica.net, (2011). Faraday Muti Market. Retrieved April 11, 2012, from SouthAfrica.net: www.southafrica.net

Sundance Channel, (2010). Polli-Bricks, the Stuff of Miracles. Retrieved August 06, 2012, from Sundance Channel: www.sundancechannel.com

Suzuki, D., (2012). Food and Climate Change. Retrieved April 01, 2012, from David Suzuki Foundation: www.davidsuzuki.org

Suzuki, D., (2012). Forests and Sinks. Retrieved April 01, 2012, from David Suzuki Foundation: www.davidsuzuki.org

Temperate Rainforest, (2012). Changes in the Park. Retrieved September 27, 2012, from Temperate Rainforest: temperaterainforest.wikispaces.com

The Guardian, (2012). Percentage of Global Population Living in Cities, by Continent. Retrieved February 23, 2012, from The Guardian: www.theguardian.co.uk

Traveling Guide Info, (2012). The Beauty of Babylon Hanging Garden. Retrieved September 26, 2012, from Traveling Guide Info: www.travelingguideinfo.com

Turok, I., (2011). Novel Map Shows Gauteng's Urban Challenges. Retrieved April 03, 2012, from IOL Property: www.iolproperty.co.za

Unknown, (2012). Spiritual Ways to Manage Stress: Reconnect with Yourself, Spirit and Nature. Retrieved September 26, 2012, from Stress Free Mama: www.stress-free-mama.com

Vincent Callebaut Architectures, (2011). Coral Reef, Matrix and Plugin for 1000 Passive Houses Port-Au-Prince 2011 Haiti. Retrieved June 07, 2012, from Vincent Callebaut Architectures: vincent.callebaut.org

We Are California, (2012). Pioneer Women/Families. Retrieved september 27, 2012, from We Are California: www.weareca.org

WeAreSignals, (2010). Around Newtown. Retrieved September 25, 2012, from WeAreSignals: www.wearesignals.net

Whitcutt, N., (2012). Featured Projects. Retrieved September 26, 2012, from Nicholas Whitcutt Architects: www.nw-architects.co.za

WHO, (2012). Food Security. Retrieved February 22, 2012, from World Health Organization: www.who.int

Wikipedia, (2012). Virgin Group. Retrieved September 27, 2012, from Wikipedia: www.wikipedia.com

Winkler, S., (2011). How Aquaponics Works. Retrieved June 18, 2012, from How Stuff Works: www.howstuffworks.com

World History, (2012). Early Humans Unit: Discovering How Sumerian City-States Emerged. Retrieved October 24, 2012, from World History: www.mitchelteachers.net

Your Dream Backyard, (2011). Plant Ideas for a Sensory Garden-Sound. Retrieved October 23, 2012, from Your Dream Backyard: www.yourdreambackyard.net

Other

Beery, M. (2012). Siyakhana Presentation. March 12. (lecture) Johannesburg: University of the Witwatersrand.

BiomimicrySA, (2012). Innovation Inspired by Nature: Intro to Biomimicry Workshop in Biomimicry Resource Handbook.

BiomimicrySA, (2012). Re-imagining Systems Resource Handbook.

DiCaprio, L., (Director). (2007). The 11th Hour [Motion Picture].

Jacobs, P. (2009). Identifying A Target For Food Security In South Africa. Unpublished Report, Centre for Poverty Employment and Growth, Pretoria: Human Sciences Research Council.

Labadarios, D., Davids, Y.D., Mchiza, Z. and Weir-Smith, G., (2009). The Assessment Of Food Insecurity In South Africa. Unpublished paper, Centre for Poverty, Employment and Growth, Human Sciences Research Council.

Cover Image: author, 2012,
Parts taken from:
Echwalu Photography, (2011). The Toughest Job in the World. Retrieved October 24, 2012, from Echwalu Photography: http://echwaluphotography.wordpress.com
Willemse, O., (2010). Unknown. Retrieved February 28, 2012, from Oriel Willemse Photography: http://orielwillemse.wordpress.com
Yay Images, (2012). Grass Silhouette Black. Retrieved February 28, 2012, from Yay Micro: www.yaymicro.com

Appendix A – Biomimicry Discovery and Comparison Chart

	Fig wasp and fig tree	Horn acacia and acacia ant	Termites
Energy	The fig tree photosynthesises, producing sugar out of water and light, which then makes the tree grow and provides food for the wasp offspring.	The acacia tree photosynthesises, producing sugar out of water and light, which then makes the tree grow and provides food for the ants.	The termite mound stays at a constant temperature inside, regardless of the external temperature fluctuations and extremes.
Water			By importing coarse particles into the soil it allows for the water to flow through the soil better, which retains water in the soil and enriches it.
Structure/Form	An edible house for the wasps in the form of fruit	A hollow bulbous base to certain thorns on the tree.	Termite mounds are made from soil shaped in mounds, often leaning north, and glued together with termite saliva. There is a labyrinth of passages and vents in the mound.
Social	In exchange for the pollination service provided by the wasp, the fig fruit provides room and board for the wasp's developing young. The fig trees "punish" the wasps for failure to pollinate by dropping unpollinated fruit, killing the wasp's offspring inside.	The bull horn acacia provides nutrients and housing for acacia ants in return for protection from herbivores.	Termites encourage social enhancement throught regenerating the soil which allows for plants to grow again. These new plants attract animals and insects which then begin to perform their respective tasks in the ecosystem.
Soil			The termites repair barren landscapes with mounds spaced fairly equally, and the mounds act as nutrient restorers for the soil. It is suspected that termites import large particles into the otherwise fine soil in the vicinity of their mounds. These coarser particles promote water infiltration of the soil and discourage shrinking or swelling of the topsoil in response to precipitation or drought. The mounds also show elevated levels of nitrogen and phosphorus. Once the soil is fertile plants and trees can come in and grow. Often they will grow near to or over the termite mounds, where the soil is more fertile.

Fibonacci Series	Hollow cylindrical tubes	Bird feathers	Forest/tree
Plants shaped like the Fibonacci spiral are able to give access to sunlight to all leaves/petals for energy and photosynthesis.		Bird feathers are lightwieght, allowing for reduced energy consumption when moving the feathers.	The main forces that affect their adapting to the location are light and gravity. Leaves photosynthesize when light hits them, turning water and carbon dioxide into energy to grow. They need sunlight to survive. Trees adjust the direction of their branches according to light, gravity and wind. The stems of trees bend when the illumination conditions have been altered so that they place themselves in new positions with respect to light, even in the confines of trees in a forest competing for light. The food-forming leaves must be arranged so that they do not compete among themselves for the enjoyment of light. This, at its basic level, is acting on a feedback loop.
Plants shaped like the Fibonacci spiral allow for efficient flow of water to every part of the plant.	Hollow cylindrical tubes allow for water or liquids to be transferred through them.	The feathers are fairly water tight, keeping the skin of the bird dry. This is achieved through many feathers overlapping, creating layers and sealing air in pockets.	Trees draw up water from the soil through the tips of their roots. The water is moved up through the wood and branches, then out to the leaves where it is used for photosynthesis. Some of the water transpires through the leaves into the air as water vapour. The roots filter the water, helping to clean it. The leaves help to break the fall of rain so that it does not cause erosion of the soil.
The Fibonacci arrangement allows for optimal space use. It works on a modular system which is based on differing scales of the same ratio. This is a continual repetition found in many examples of nature.	Hollow cylindrical tubes, as demonstrated in bamboo stems, vertebrae long bones, insect, spider and crustacean appendages, and feather shafts of birds, give high flexural and torsional stiffness with minimal material use. They are lightweight structures but do not compromise on strength.	A central shaft carries on either side a hundred or so filaments; each filament is similarly fringed with about a hundred smaller filaments or barbules. Barbules overlap those of neighbouring filaments and hook them onto one another so that they are united into a continuous vane. There are several hundred such hooks on a single barbule, a million or so in a single feather; and a bird the size of a swan has about twenty-five thousand feathers.	Trees are made from wood, which is a fibrous material of great tensile strength. As a result they are able to twist and bend in many different directions without falling. The roots stick into the ground, anchoring the tree agains heavy winds and gravity. The branches aer arranged so that each leaf can have access to sunlight.
			What came up about the overall structure of the forest are the gradients and hierarchies in a forest ecosystem in terms of the plant succession and scales. It starts with grasses and legumes, and then moves to perennial shrubs, then up to larger trees. A forest ecosystem is more than just plants though – it is a terrestrial unit of living organisms (plants, animals and microorganisms), all interacting among themselves and with the environment (soil, climate, water and light) in which they live. The environmental "common denominator" of that forest ecological community is a tree, who most faithfully obeys the ecological cycles of energy, water, carbon and nutrients.
			Trees root themselves in soil. They draw the nutrients from the soil to grow, they clean the soil, they hold the soil and prevent erosion, and the leaves of the tree add to forest litter which is an essential ingredient in maintain soil health. Forest litter comprises fallen leaves, moss, and other lowly ground vegetation, and is indispensable for the maintenance of the forest. The trees and forest litter are important for groundwater hydrology. They help to regulate local evaporation and rainfall patterns. The trees store large amounts of water. On decay of the forest litter it gives back to the soil the greater part of the store of nutrients, especially nitrogen. It protects the soil from consolidation and drying out, nourishes the micro flora and fauna, and increases soil fertility.

Appendix B – Table of a healthy Diet (Source: Bonti-Ankomah, 2001)

Table 2: A Healthy Diet and Expenditure per day

Food Item	Unit (gm)	Price/gm (Cents)	Total Cost (Rands)
Cereals & Cereal Products:			
Bread (2 slices)	60	0.372	0.223
Cooked Rice	125	0.398	0.498
Cooked mealies	70	0.25	0.175
Vegetables:			
Potato	120	0.199	0.238
Cabbage	20	0.186	0.037
Pumpkin	40	0.263	0.105
Carrot	20	0.327	0.065
Fruit:			
1 small orange	120	0.343	0.412
Orange Juice	200	0.500	1.000
Milk and Milk Products:			
Fresh milk	300	0.336	1.008
Yoghurt	200	1.651	3.302
Meat and Meat Products:			
Poultry	45	1.402	0.631
Beef	45	2.249	1.012
Egg	22.5	0.968	0.218
Legumes:			
White Beans	60	0.753	0.452
Fat and Oil:			
Cooking Oil	10	0.641	0.064
Margarine	10	1.050	0.105
TOTAL			9.55