Author Susan M Effenberger, Student Environmental Engineering (PhD), susan.effenberger@uon.edu.au, Version 19/04/2018 22:00
Supervisors Dr In-Young Yeo (Engineering), Professor Tim Roberts (Environment & Life Sciences)
Supported by an Australian Government Research Training Program Scholarship. This research acknowledges the Aboriginal Traditional Owner custodianship of Country and Elders past and present.

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Regenerating the South Maitland Coal Field: from mining legacy to SDGs by 2036

FEATURING THE

High Res Geospatial Design System for Transformative Change

Big Data Mining; Terrain GeoDB; Urban GeoDB
High Resolution Geospatial Analysis; LiDAR
Remediation & Risk (Statistical & Probabilities) Model
Decision Analysis & Sustainable Urbanism & UN SDGs & Design Scenario Model
Landscape Transformational Tool

AIM...
To prove that High-Resolution Geospatial Analysis can help visualise and inform the transformation of a degraded post-mining landscape to a sustainable cityscape meeting the United Nations Sustainable Development Goals SDGs (2016). The South Maitland Coal Field SMCF is the testbed.

HOW...
By constructing a "Geospatial Design System for Transformative Change" in a deep "space-time" train of analysis models❖ using Open Source Software OSS and code. This will include statistical correlation, probabilities and sustainable design guidelines.
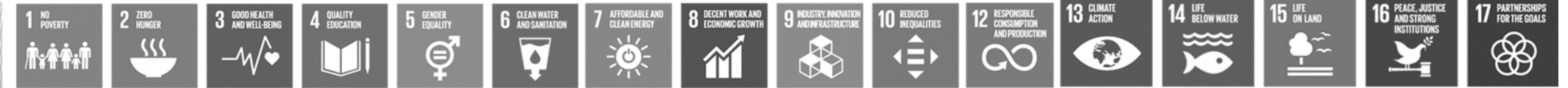
WHY...
The System will inform government Decision-makers, Designers and Planners with scientific and spatial accuracy in land use planning. Educators of Sustainable Development, Urbanism and SDGs (2013) can use it as a learning tool.
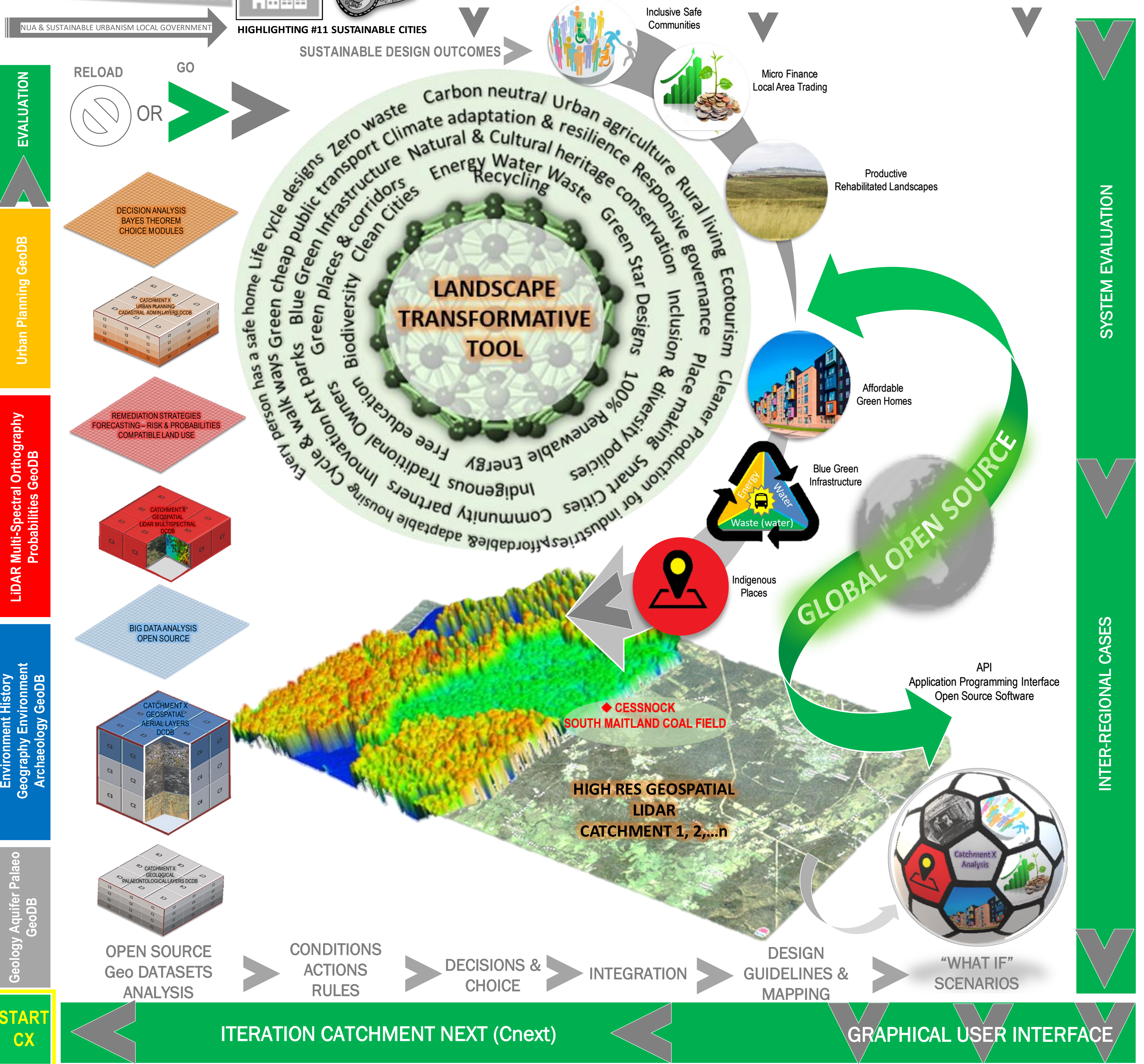
THEN...
Once the System is in prototype form for a specific Catchment X (Cx) testbed, a system test will use datasets for the next Catchment in the SMCF (Cnext) with no mining impact as a control. A Catchment outside the SMCF will be the third testbed. Suitably qualified operators will test the prototypes, requiring a Human Ethics protocol.

❖The models will connect to a "pipeline of attributes" to create maps and design guidelines from geophysical, water cycle, substrate, vegetation, energy/water/waste infrastructure, community, heritage and urban settlement datasets (GeoDBs), aerial photography, LiDAR, multispectral imagery and best practice guidelines.

NEW URBAN AGENDA

NUA & SUSTAINABLE URBANISM LOCAL GOVERNMENT

**UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS 2016
UNDERPINNING THE NEW URBAN AGENDA 2017
PROVIDE CONDITIONS ACTIONS AND RULES**

HIGHLIGHTING #11 SUSTAINABLE CITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

SUSTAINABLE DESIGN OUTCOMES

Inclusive Safe Communities

Micro Finance Local Area Trading

Productive Rehabilitated Landscapes

EVALUATION

RELOAD OR GO

LANDSCAPE TRANSFORMATIVE TOOL

Carbon neutral/ Urban agriculture Rural living Ecotourism Cleaner production Climate adaptation & resilience Responsive governance Place making Smart Cities Inclusion & diversity policies 100% Renewable Energy Green Star Designs Waste Recycling Energy Water Natural & Cultural heritage conservation Green places & corridors Biodiversity Blue Green Infrastructure Clean Cities Green cheap public transport Zero waste Life cycle designs Every person has a safe home walk ways Green Cycle & walk ways Innovation Art parks Free education Traditional Owners Indigenous partners Community & adaptable housing affordable Affordable for industry Smart

DECISION ANALYSIS BAYES THEOREM CHOICE MODULES

CATCHMENT X URBAN PLANNING CADASTRAL ADMIN LAYERS DCDB

REMEDIATION STRATEGIES FORECASTING – RISK & PROBABILITIES COMPATIBLE LAND USE

CATCHMENT X GEOSPATIAL LIDAR MULTISPECTRAL DCDB

BIG DATA ANALYSIS OPEN SOURCE

CATCHMENT X GEOSPATIAL AERIAL LAYERS DCDB

CATCHMENT X GEOLOGICAL PALAEONTOLOGICAL LAYERS DCDB

EVALUATION
Urban Planning GeoDB
LiDAR Multi-Spectral Orthography Probabilities GeoDB
Environment History Geography Environment Archaeology GeoDB
Geology Aquifer Palaeo GeoDB

START Cx

Affordable Green Homes

Blue Green Infrastructure

Energy / Water / Waste (water)

Indigenous Places

GLOBAL OPEN SOURCE

◆ CESSNOCK
SOUTH MAITLAND COAL FIELD

HIGH RES GEOSPATIAL LIDAR CATCHMENT 1, 2,...n

API
Application Programming Interface
Open Source Software

Catchment X Analysis

SYSTEM EVALUATION

INTER-REGIONAL CASES

OPEN SOURCE Geo DATASETS ANALYSIS

CONDITIONS ACTIONS RULES

DECISIONS & CHOICE

INTEGRATION

DESIGN GUIDELINES & MAPPING

"WHAT IF" SCENARIOS

ITERATION CATCHMENT NEXT (Cnext)

GRAPHICAL USER INTERFACE

REFERENCES

Branagan D 2005. TW Edgeworth David: A life. Geologist adventurer soldier and "Knight in the Old Brown Hat". Published by National Library of Australia.

Brundtland G 1987. Our Common Future. For the World Commission on Environment and Development WCED. Published by Oxford University Press.

Cessnock City Council 2017. Cessnock 2027 Community Strategic Plan (2017). Published report on the strategy.

Cressie N 2015. Spatio-temporal Statistics in Geodesign. Key note address at the Geodesign Summit. Geodesign http://www.esri.com/products/arcgis-capabilities/ geodesign accessed 15/7/17

Effenberger S 2017. Environmental Sustainability Strategy. Unpublished report to the Central Coast Council NSW. April 21 2017.

Farr D 2007. Sustainable Urbanism: Urban Design with Nature. Wiley, Hoboken.

Fisher RA 1935. The design of experiments. Published by Oliver & Boyd Edinburgh UK.

Getman D 2015. Creation, Analysis, Sharing, and Visualization of Complex Spatiotemporal Data. Using free and open software at the National Renewable Energy Laboratory. US National Renewable Energy Laboratory. Presentation to the FOSS4G North America 10 March. YouTube https://youtu.be/ 2__yJle0_l8?list=PLjbCIBuqRQEe7HisUtGwT5j1azhjSe5G accessed 19/7/17.

Gil-Garcia JR, Pardo TA, Taewoo Nam eds 2016. Smarter as the New Urban Agenda: A Comprehensive View of the 21st Century City. Published by Springer http://bit.ly/2vaOSo7.

Gomboso-Effenberger S 1999. A logical decision model to appraise Ecologically Sustainable Development in coastal Environmental Impact Statements. Unpublished thesis, Master of Science (Geosciences) University of Sydney NSW. Submitted November 1998.

O'Neil-Dunne J, MacFaden S & Royar A 2014. A Versatile, Production-Oriented Approach to High-Resolution Tree-Canopy Mapping in Urban and Suburban Landscapes Using GEOBIA and Data Fusion. Remote Sensing 2014, 6(12), 12837-12865; doi:10.3390/rs61212837. Collaboration between Spatial Analysis Laboratory SAL, University of Vermont UOV, and Department of Agriculture DOA (Forestry) USA, 22 December 2014.