

Conceptual Environmental Analysis Matrix

Background

The Garnaut Review Secretariat has asked for public comments as part of The Garnaut Climate Change Review which is an independent study by Professor Ross Garnaut, commissioned by Australia's State and Territory Governments on 30 April 2007. The review will examine the impacts of climate change on the Australian economy, and recommend medium to long-term policies and policy frameworks to improve the prospects for sustainable prosperity. The Review's final report is due 30 September 2008.¹

Introduction

There is a lack of a conceptual truly dynamic three dimensional mathematical matrix approach to be able to measure the impact of climate change on the environment. In essence, the Environmental Analysis Matrix ("Environment Matrix") is a conceptual three-dimensional matrix model that would assist in the evaluation of the impact of climate change on the environment statically or dynamically. If practically applied the Environment Matrix could be used as an environmental modelling and analysis tool (including as prediction tool) by users of the information to improve the prospects for sustainable prosperity for Australia and humankind.

The Environmental Matrix

The Environmental Matrix itself is based on a new three-dimensional matrix economic theory, which uses the three axes, six sides and limitless fields of the Environment Matrix to model data and the outcome of any mathematical technique used to evaluate the impacts on the environment on climate change. In essence the Environmental Matrix is another way to look at the environment three dimensionally, in addition to how it is currently viewed. The Environmental Matrix is able to accommodate all existing environmental modelling and measurement techniques.

As the Environmental Matrix is three-dimensional it is possible to have two depth axes. The first depth axis is the multi-layered fields of internal, external and environmental analysis data. The second depth axis accommodates the measurement of time (*t*) by multi-tiering fields of data at points in time. Having two depth axes means that the evaluation of the environment can be performed statically (at a point in time) or, dynamically (over any period of time or, combination of time periods), both analyses could accommodate future time period analysis.

The multi-layered data is presented as a bar chart or dots statically and, as a six-sided graphic equalizer dynamically on each side of the Environmental Matrix. The multi-tiered fields of data allow the Environmental Matrix to be made dynamic, much like a comic is made into a picture. It is therefore possible to view the patterns, trends and flows of data over any time period or combination of time periods.

The Environmental Matrix is also multi-dimensional as the examination of internal, external and environmental analysis data can be applied at any level. For example, an examination of the impacts on the environment of climate change can be undertaken at the global, regional, country, area, entity and individual level.

The Environmental Matrix also has input and output capabilities that allow for interaction between external providers and users of the data. This is important as often it is the case that someone's internal data is someone else's external data.

¹ <http://www.garnautreview.org.au/CA25734E0016A131/pages/about>

Traditional two-dimensional environmental analyses techniques are used when building the Environmental Matrix. Although the Environmental Matrix presents a new three-dimensional way to view data (as a 3D matrix model), it can also be manipulated to present data two dimensionally as we are accustomed to presently, for example, when doing environmental analysis diagrams. The Environmental Matrix is able to accommodate any type of mathematical environmental analysis, including current environmental modelling techniques used to evaluate the impacts on the environment of climate change, provided the internal and external data is present to perform the mathematical operation.

How an Environmental Matrix is built

The six sides and three axes of the Environmental Matrix accommodate the limitless fields of numerical data and environmental analysis data. The fields store the positive, negative or zero value of data and when multi-layered form the three axes of the Environmental Matrix.

As the impact on the environment of climate change is the 'test' subject matter being analysed in the Environmental Matrix the environmental data forms the basis of the internal data axis.

The first axis captures the environmental internal numerical data and any other relevant data in order to perform the analysis of the impact on the environment of climate change. Such data would include, weather monitoring data and global temperature data.

The second axis in the Environmental Matrix is used to capture the external data. Such data would include CO₂ emissions and global deforestation data, as well as any other relevant numerical information necessary to perform the analysis of the impact on the environment on climate change.

The third axis in the Environmental Matrix is used to accommodate the evaluation of the impact on the environment of climate change and can be viewed statically or dynamically. The criteria used to evaluate the impact on the environment of climate change are reduced to mathematical formula(s). For example, if The Garnaut Review determined that global CO₂ emissions is a relevant evaluation criteria of the impact on the environment of climate change then this side of the Environment Matrix would perform the analysis and give the numerical answer statically or dynamically.

It is important to note that as the Environmental Matrix can accommodate limitless fields of information it is possible to add to, change or manipulate the data and information in whatever way the user desires. For example, if The Garnaut Review determined that global deforestation is considered to be a relevant evaluation criteria impacting on climate change then its effect could also be measured. Another example might be the impact of economic growth on climate change.

Measuring the impact of climate change on the environmental is a complex science and there are a multitude of environmental models and formulas used to do this. However, all such analysis comes down to a mathematical formula which will provide an answer whose integer will either be positive, negative or zero (no matter how complex the mathematical equation) and therefore able to be accommodated within the Environmental Matrix.

I have drawn a few diagrams at Appendix 1 to show how to build and view the Environmental Matrix. I apologise for the quality of my drawing skills.

David Kovic
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Diagram 1 – The three axes of the three dimensional Environmental Matrix:

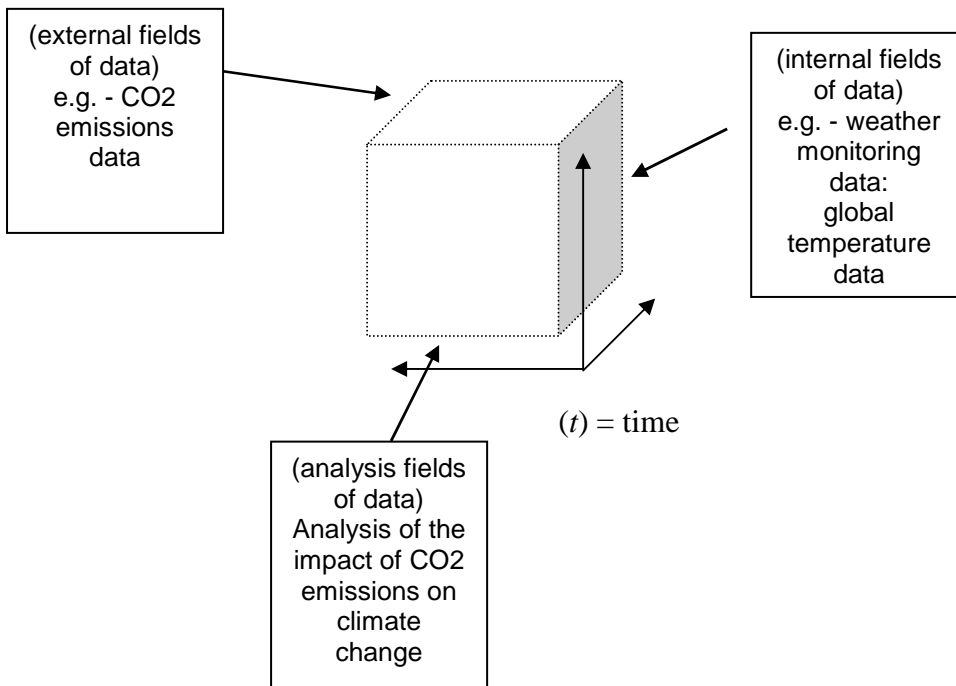


Diagram 2 – Another way to view a bar chart on a piece of paper:

The diagram shows that there are two ways to look at the same line. Line 1 can be viewed as Line (2) on the edges of a sheet of paper:

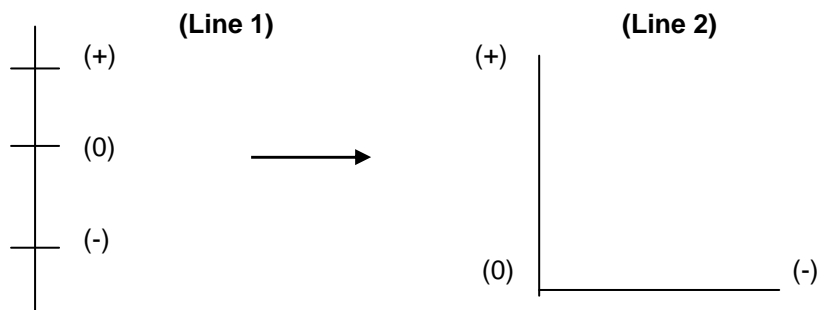


Diagram 3 – Fields within the Environmental Matrix:

The Environmental Matrix allows for limitless number of internal, external and analysis fields of data.

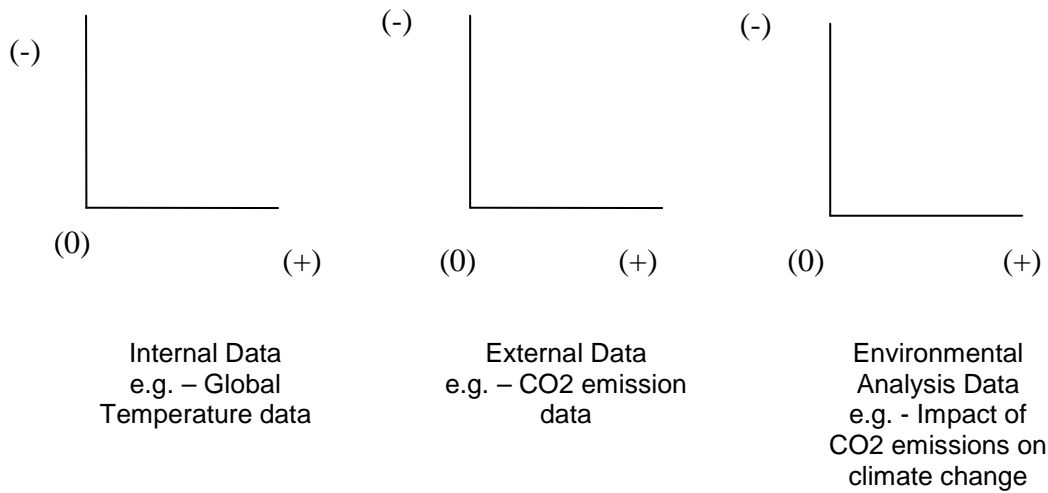


Diagram 4 – How the fields are layered into the Environmental Matrix:

The three fields can be layered three ways (depth, width and height) into the Environmental Matrix.

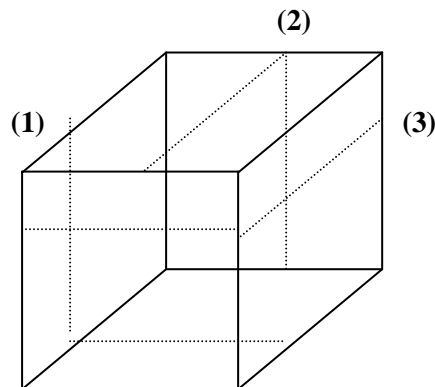


Diagram 5 – How fields are multi-layered in the Environment Matrix to form the first depth axis:

Each axes of the Environment Matrix is able to accommodate multi-layered fields of data and each axis is able to accommodate limitless fields of data at a point in time. This is how the first depth field of the Environment Matrix is constructed.

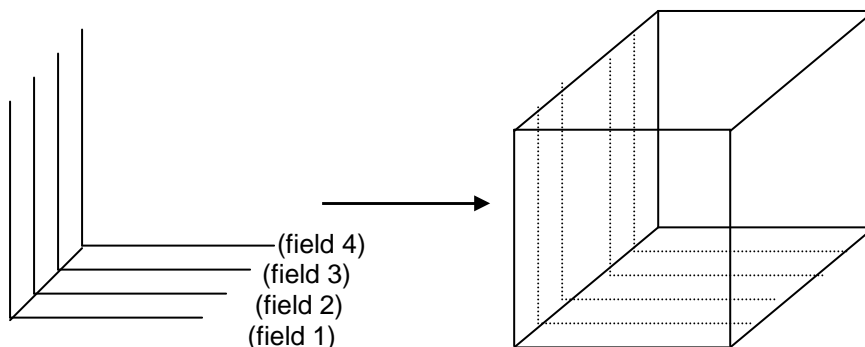


Diagram 6 – The input/output capabilities of the Environmental Matrix:

Any field in the Environmental Matrix can be rotated 90 degrees so that someone’s internal data can be used as someone else’s external data (or vice-a-versa).

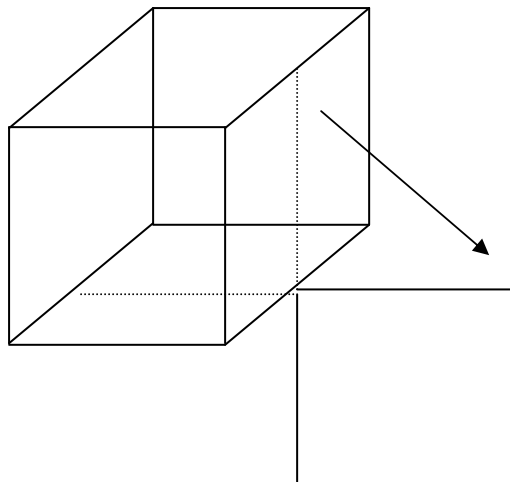


Diagram 7 - Multi-tiering fields of data in the Environmental Matrix to form the second depth axis:

The model is made dynamic by multi-tiering fields of data on top of each other. This is how the second depth field of the Environmental Matrix is constructed.

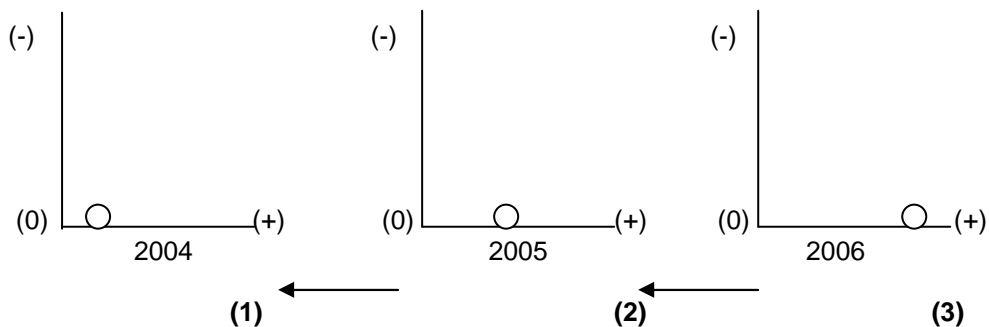


Diagram 8 – Rotating axis 90 degrees to view a time line analysis as we traditionally do:

If the negative axis is rotated 90 degree in Diagram 7 then it is possible to view a time line of data as we traditionally do two dimensionally.

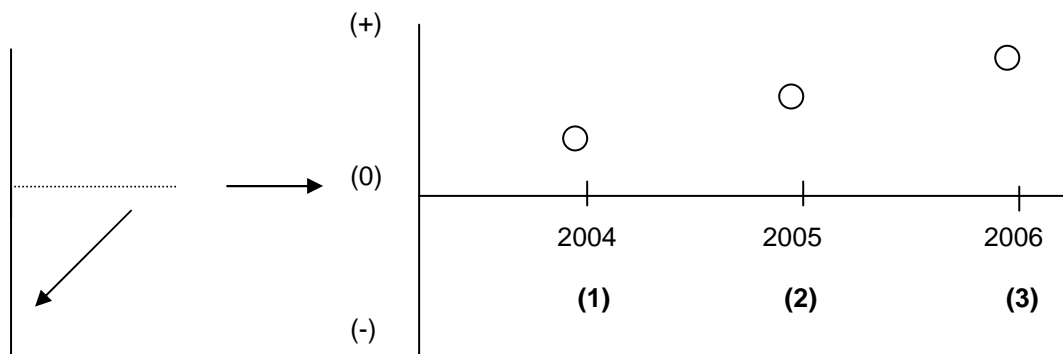


Diagram 9 – How the Environmental Matrix accommodates traditional economic analysis:

Economic theory dictates that the *explanatory independent variable* is plotted on the horizontal axis and shows the value of the known variable (x), and the *dependent variable* is plotted on the vertical axis and shows the value of the unknown variable (y), for example, when performing *linear calibration regression analysis*. Depending on the purpose of the economic analysis the *dependent variable* may be known, for example, when performing *linear regression analysis*.

The diagram below shows that if the negative or positive axis is rotated 90 degree then a straight line is formed (Steps (1) and (2)). A horizontal line, representing the *explanatory independent variable* – (x), for example, CO2 emissions, can be layered on top of a vertical line, representing the *dependent variable* – (y), for example, impact on the environment of CO2 emissions, thus showing how the Environmental Matrix can be manipulated to view *linear calibration regression analysis* (Steps (3) and (4)). The static relationship of the variables can be made dynamic as depicted in Diagram 10.

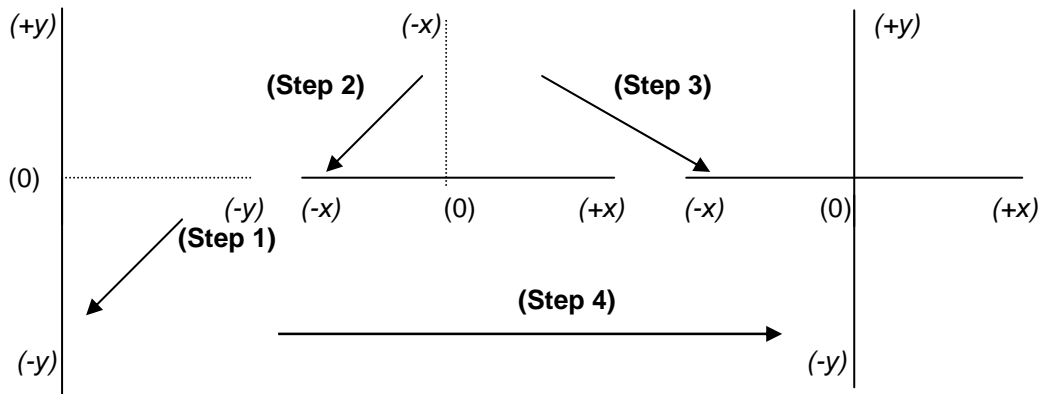


Diagram 10 – A way to manipulate the Environmental Matrix to view traditional environmental analysis three dimensionally:

This diagram demonstrates that time can be plotted on the depth axis (z) of the vortex of the *explanatory independent variable* (x) and *dependent variable* (y). This diagram shows how traditional two-dimensional economic analysis is made dynamic. Time ($z = t$) can be plotted in the past ($-t$) or extrapolated into the future ($+t$).

