Context-Based GHG Metrics – A Proven Approach

A Presentation to WRI
Washington, DC

By Mark W. McElroy, Ph.D.
The *Center for Sustainable Organizations*

July 15, 2013

(with new background added in April 2023)

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Background

* This presentation was made to an audience at WRI in Washington, DC on July 15, 2013 consisting of Pankaj Bhatia (WRI), Nigel Topping (CDP), Marty Spitzer (WWF), John Sottong (U.S. EPA), and Bill Baue (now of r3.0).
* McElroy's presentation was made with the support of Mr. Baue in a shared attempt to convince WRI of the need to enhance the Greenhouse Gas Protocol in such a way that emissions could be measured by organizations against context-/science-based targets and not just in isolated terms.
* As noted in the slides that follow, we (CSO) had been taking this approach since 2006 with our Context-Based Carbon Metric (when first used with Ben & Jerry's that year) and were anxious to see WRI do the same in order to make measurement of GHGs by organizations more meaningful.
* WRI, CDP and WWF would later go on to create the Science-Based Targets Initiative (SBTi) program – for which Messrs. McElroy and Baue served as advisors – in which the CSO carbon metric was initially featured as a recognized tool for target setting, then later dropped by SBTi in favor of using tools of its own making.
* Today, ten years later, the CSO metric has continued to evolve and makes it possible for organizations, municipalities, and educational institutions to not only set context- and science-based targets, but to also measure and report performance against them. The SBTi tool, by contrast, is for target setting only and does not in any way support performance measurement and reporting.
* Only some minor changes in formatting are made in the slides that follow.

Mark W. McElroy, PhD
Founding Director, CSO
April 29, 2023

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  * Norms, standards, or thresholds

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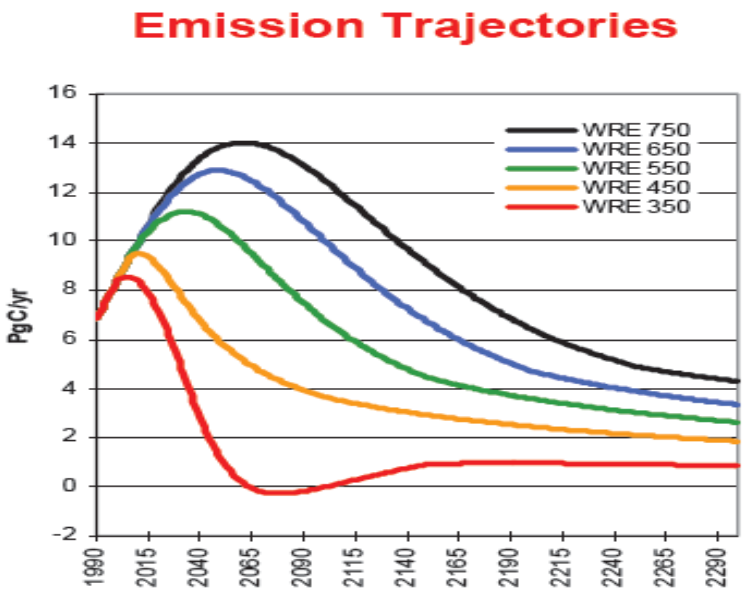
* Thresholds allocated to individual organizations
* Impacts measured against allocations
* For GHGs, relevant threshold is assimilative capacity of the environment

Our Context-Based Carbon Metric

1. Starts with selection of GHG stabilization scenario



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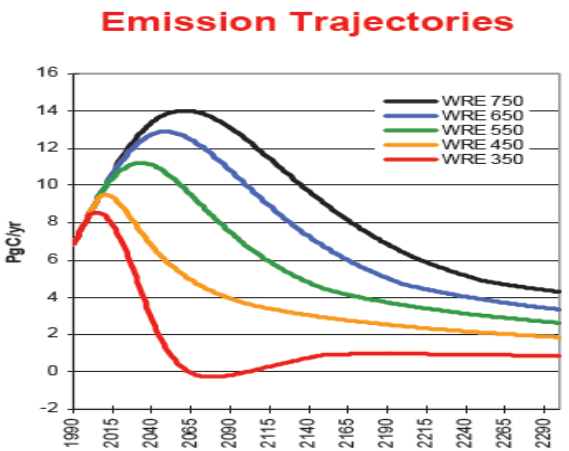

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5. Measure and report results

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How We Address the Challenges

* Disaggregating to org'l level raises some challenges:
  * How to account for changes in an org'l size over time
  * How to account for changes in the # of orgs over time
* Re: first challenge: Use relative metric that is indifferent to changes in size
* Re: second challenge: Continually adjust allowable emissions to changes in the size of GDP

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Our Basic Unit of Measurement

Both solutions achieved by expressing emissions as:

emissions per $ of contribution to GDP

Rolled Up Into a CBM

$$\frac{\textbf{Actual emissions per \$CGDP}}{\textbf{Normative emissions per \$CGDP}}$$

Any score of $\leq$ 1.0 = sustainable, > 1.0 = unsustainable

Sample Input and Output

	(2005)	2006
Company's Value-Add to GDP (Gross Margins/Profits)	200,000,000	225,000,000
Company's CO_2 Emissions (tCO_2)	100,000	105,000
[Variable to be Used for Relative or Intensity Measures (Units?)]	50,000	55,000
Company's Actual CO_2 Emissions Per $CGDP[3] in Baseline Year (tCO_2)	0.00050	

Context-Based Carbon Footprint Scores	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Company's Cumulative CO_2 Emissions (tCO_2): N_a		105,000	211,000	318,000	426,000	535,000	645,000
Company's Maximum Allowable Cumulative Emissions (tCO_2) (Absolute): D_a		99,514	198,541	297,095	395,163	492,744	588,906
Cumulative Gross Emissions ('Absolute' Score): N_a/D_a		**1.055**	**1.063**	**1.070**	**1.078**	**1.086**	**1.095**
Company's Annual CO_2 Emissions Per $CGDP: N_b		0.000467	0.000424	0.000389	0.000360	0.000335	0.000314
Company's Maximum Allowable Annual Emissions Per $CGDP ($tCO_2$) (Global): D_b		0.000473	0.000448	0.000434	0.000436	0.000413	0.000392
Annual Emissions Per $CGDP ('Context-Based' Score): N_b/D_b		**0.986**	**0.947**	**0.896**	**0.826**	**0.813**	**0.802**
Company's Cumulative CO_2 Emissions Per $CGDP: N_c		105,000	211,000	318,000	426,000	535,000	645,000
Company's Maximum Allowable Cumulative Emissions Per $CGDP ($tCO_2$) (Global): D_c		106,501	218,418	337,887	468,703	602,848	740,080
Cumulative Emissions Per $CGDP ('Context-Based' Score): N_c/D_c		**0.986**	**0.966**	**0.941**	**0.909**	**0.887**	**0.872**
Annual Scores by Type of Metric							
Absolute (Gross Emissions)	**100,000**	**105,000**	**106,000**	**107,000**	**108,000**	**109,000**	**110,000**
Relative (e.g., Emissions Per Unit of Production)	**2.00**	**1.91**	**1.77**	**1.65**	**1.54**	**1.45**	**1.38**
Context-Based CO_2 Emissions (Actual/Normative)		**0.986**	**0.947**	**0.896**	**0.826**	**0.813**	**0.802**

A Proven Method

Ben & Jerry's Global Warming Social Footprint 2005-2007

	2005	2006	2007
Reference figure: B&J Full-Time Employees	505	514	508
B&J Total Number of People Feet[1]	129	127	125
Global Population (Billions)[2]	6.470	6.549	6.628
Global Population Indexed to 2005 Baseline	1.000	1.0122	1.0244
Carbon Emissions Required to Stabilize CO_2 at 350ppm: The Denominator			
Maximum Annual Global Emissions Allowed under WRE 350 Scenario (GtC/yr)[3]	7.608	7.571	7.534
Allowable Annual Carbon Emissions Indexed to 2005 Baseline of WRE 350 Scenario	1.0000	0.9951	0.9903
Annual Carbon Emissions Allowed Per Capita/People Foot at B&J Under 350 ppm Scenario based on 2005 Baseline of 11.16 tC/yr/People Foot Reduced for Global Population Growth	11.16	10.97	10.78
Actual Net Carbon Emissions at B&J's: The Numerator			
Actual Annual Carbon Emissions at B&J's (tC/yr)	1,442	1,279	1,274
Net Cumulative Carbon Emissions at B&J's (tC): The Numerator		1,158	2,197
B&J's Global Warming Social Footprint (CO_2 Stabilization-related Only)			
Actual Cumulative Carbon Emissions at B&J's, (tC): The Numerator		1,158	2,197
Cumulative Carbon Emissions Allowed under WRE 350 Scenario, weighted (tC): The Denominator		1,388	2,737
Global Warming **Societal Quotient** Expressed in Cumulative Per Capita/People Foot perspective[4]		0.834	0.803

First used at *Ben & Jerry's* in 2006!

← Actual CO_2 emissions

← Allowable CO_2 emissions

← Sustainability scores

A Proven Method (cont.)

More recently at *Cabot Creamery's* manufacturing facilities in New England

	2005	2006	2007	2008	2009	2010	2011
Absolute - tCO_2	78,122	74,777 ☺	76,924 ☹	80,827 ☹	80,372 ☺	77,576 ☺	76,577 ☺
Relative - $kgCO_2$ per 1000 lbs. of product produced	370.21	343.51 ☺	355.50 ☹	343.89 ☺	309.94 ☺	259.45 ☺	213.33 ☺
Context-Based - Actual emissions/ normative emissions	1.000	0.905 Ⓢ☺	0.740 Ⓢ☺	0.871 Ⓢ☹	0.794 Ⓢ☺	0.822 Ⓢ☹	0.762 Ⓢ☺

Notes:

1. ☺ = Trending Favorably; ☹ = Trending Unfavorably
2. Ⓢ = Sustainable
3. Any Context-Based Score of ≤ 1.0 = Sustainable; > 1.0 = Unsustainable

Multi-Metric Study of Cabot's CO_2 Emissions

A Proven Method (cont.)

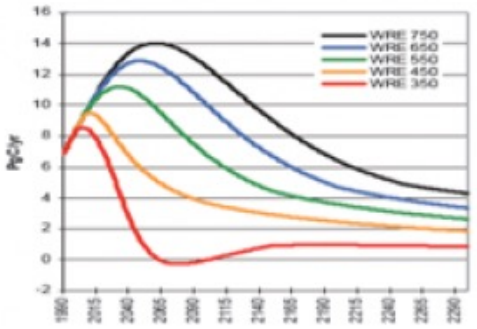
Donella Meadows Institute has developed a community oriented implementation

Climate Change Mitigation Tool

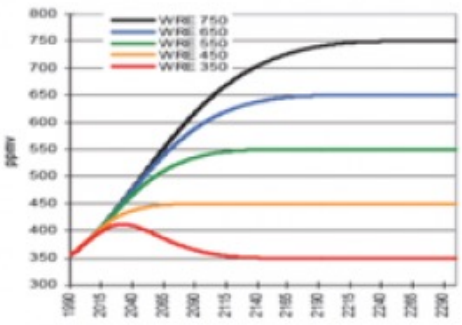
Home » Our Work » **Climate Change Mitigation Tool**

In 2011, the Donella Meadows Institute developed the first of its kind "context-based community climate mitigation tool" in collaboration with the Sustainability Committee of Hanover, New Hampshire USA. This unique approach allows communities to set *local* targets for annual CO2 emissions based on *global* emissions scenarios.[1] The tool, which provides community-specific information based on data inputs, can be translated for use in other communities by inputting different, local data sets.

Emission Trajectories

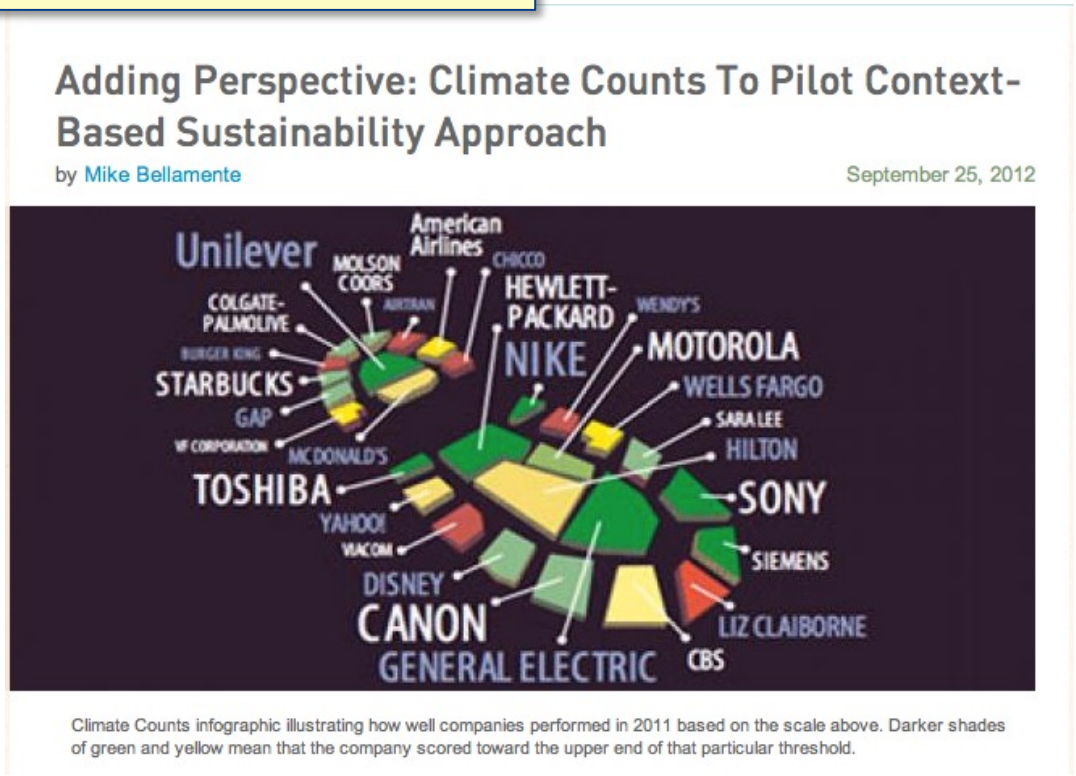


Concentration Trajectories



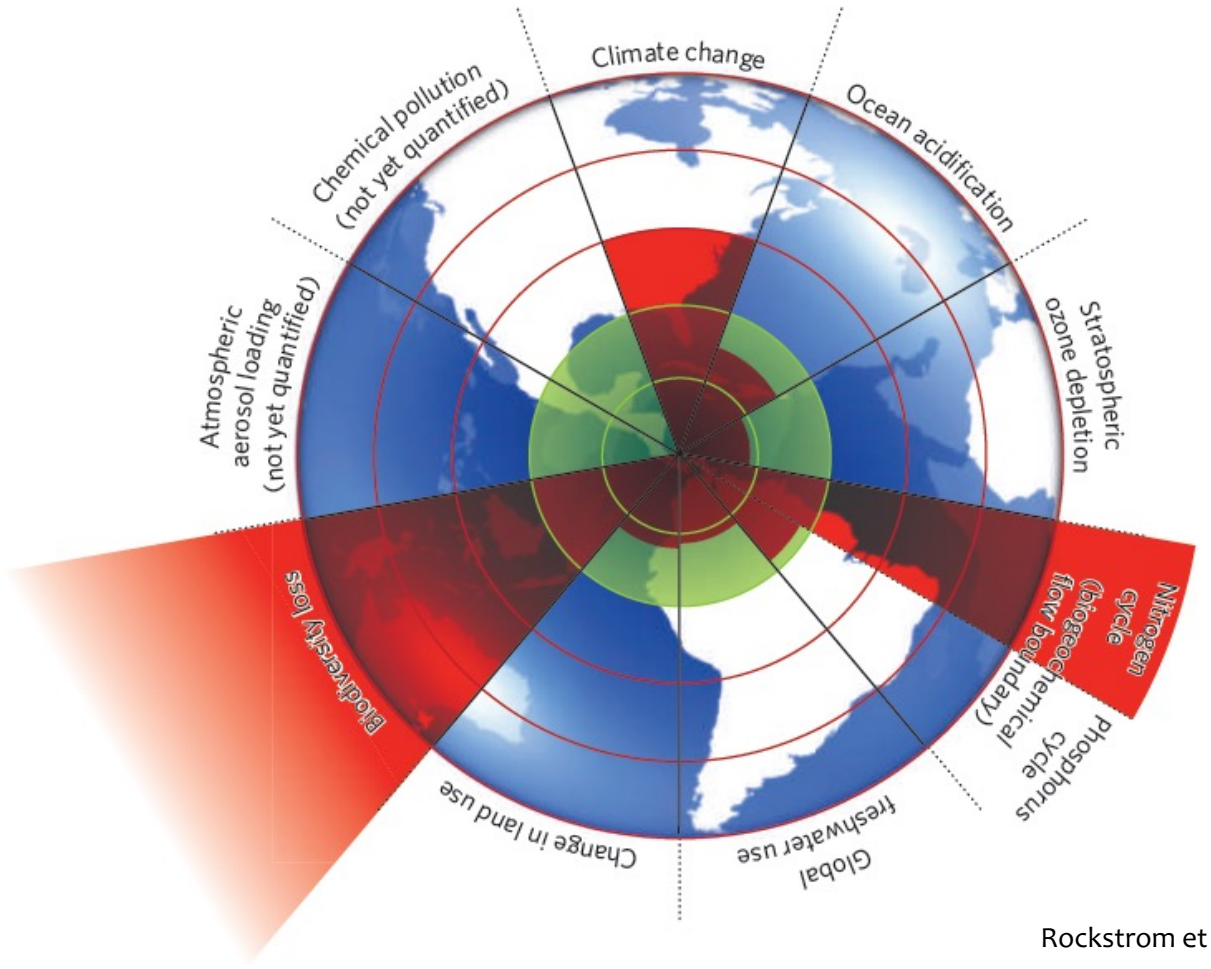
A Proven Method (cont.)

Climate Counts at UNH now working with us to produce world's first context-based carbon ranking in the capital markets!



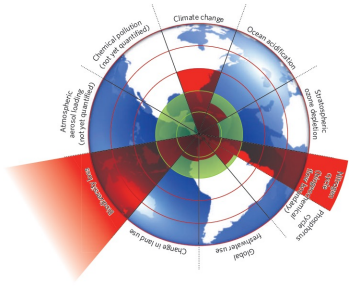
Recent Developments in Context-Based Reporting

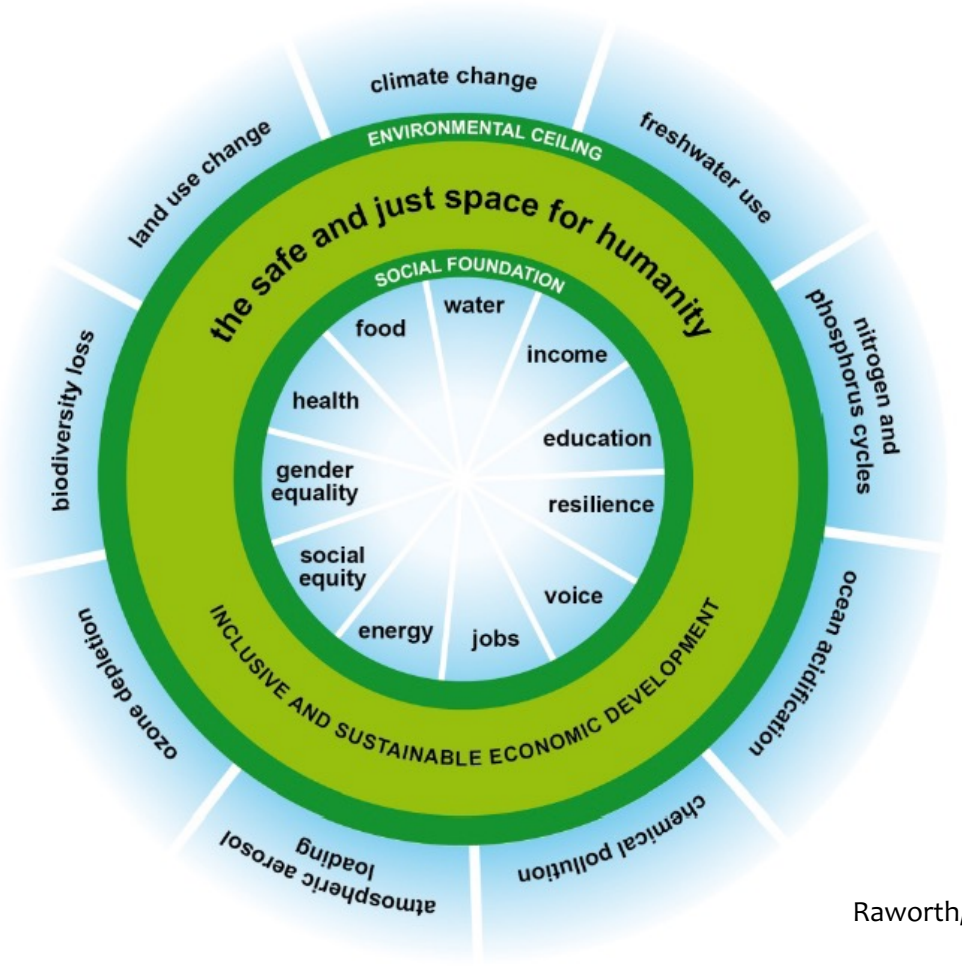
Planetary Boundaries



Rockstrom et al, 2009

Adding Social Foundations to the Mix

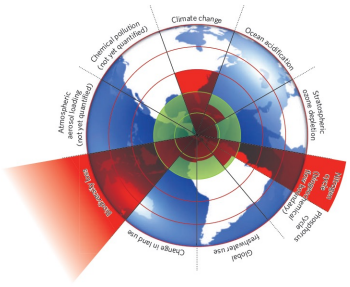




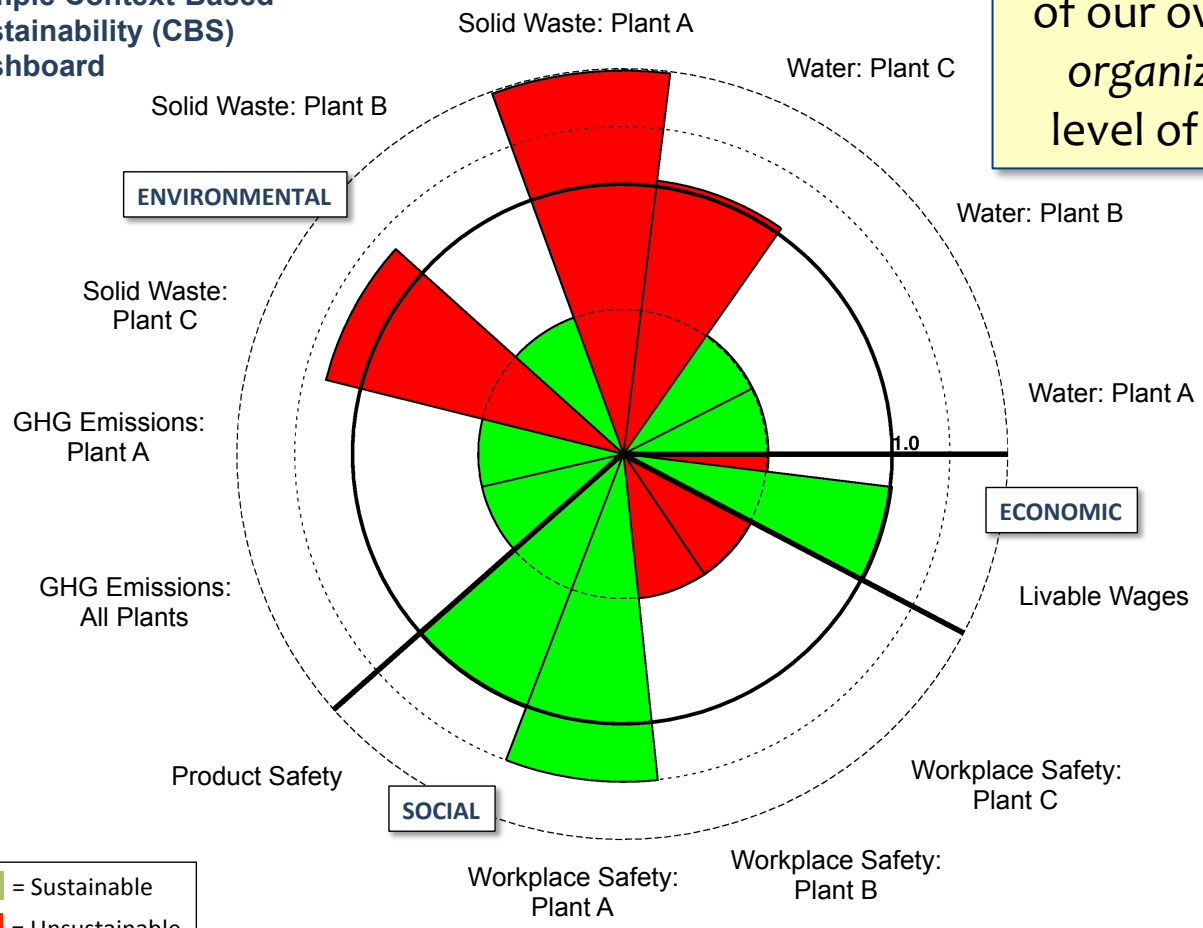
Raworth/Oxfam, 2012

CBS Dashboard

An implementation of our own at the *organizational* level of analysis



Sample Context-Based Sustainability (CBS) Dashboard



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* CSO's context-based metric was first of its kind
  * Context-based carbon metric
  * For use at organizational level
* Can be used with any GHG stabilization scenario
* Field tested and proven in practice
* Context-based measurement/reporting now taking hold

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Thank you!

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