HI-TECH&AMBIENTE 2015

WOODROW W.CLARK, II

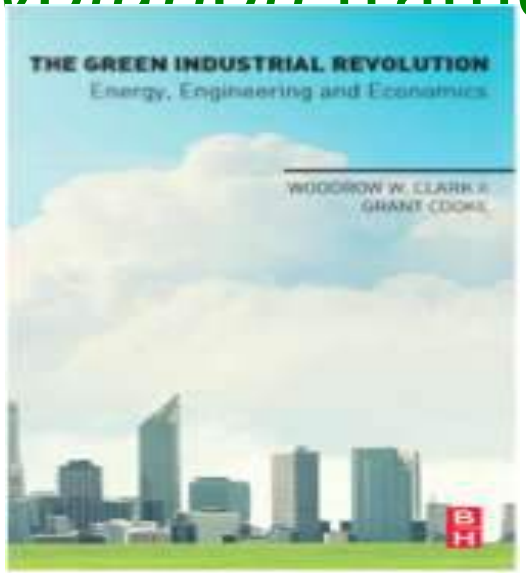
Qualitative Economist Managing Director

Clark Strategic Partners

Circular Economy in the *Green Industrial Revolution* framework

Remedia
PASSIONE PER L'AMBIENTE

In cooperation with
FONDAZIONE per lo SVILUPPO SOSTENIBILE
Sustainable Development Foundation



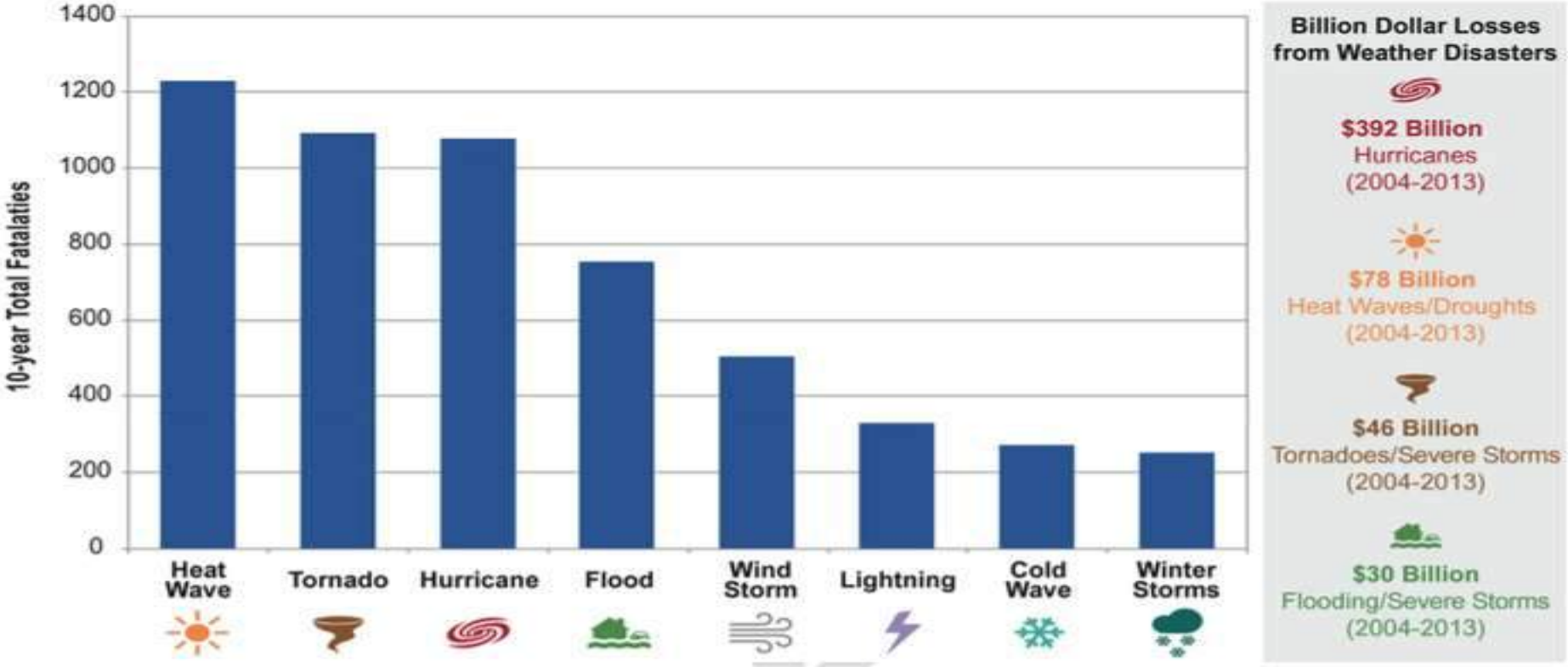
Woodrow W. Clark II, MA[3], PhD
Qualitative Economist/Managing Director
Clark Strategic Partners

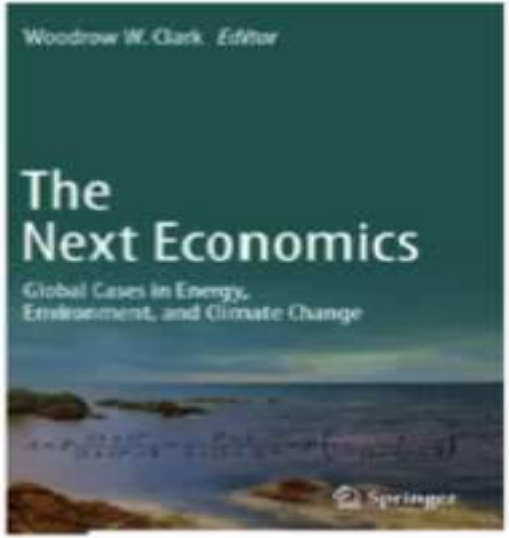
Hi-Tech&Ambiente
June 10th
2015

Milan, Italy

IT'S ABOUT PEOPLE … (AND SOCIAL COSTS)!

Estimated Deaths and Billion Dollar Losses from Extreme Events in the United States 2004-2013





Patent Invention Disclosure:
Applied dated: February 12, 2012
Economic Efficiency Through Lighting (Nularis Corporation)

Title: Method and design of software and related systems which couple amortized loan terms and payments with predicted and actual energy cost savings.
Inventor(s): Woodrow W. Clark II PhD, Wendell Brown, and Jonathan Fram

Background of the Invention:
Energy efficiency and conservation are important in order to achieve international goals for reduction of greenhouse gas emissions, fossil fuel usage, grid load strain, costs, and a wide range of other benefits. However, many approaches to energy efficiency and conservation involve significant capital outlays that create financial management risk, provide undetermined return-on-investment rates and payback periods, which often hinder their adoption.
These inventions relate particularly to methods and design of software and systems which run in computing environments (computer hardware, virtual CPU environments, servers, computers, tablets, wireless mobile devices, etc.) that couple and integrate amortized payment terms and amounts with predicted and actual energy cost savings. The inventions are thus novel, innovative, and useful in that they provide a mechanism for financial risk reduction/management and predictable cost outlays (loan repayment terms that are directly linked to energy savings), thus serving as an enabler for the financing of such energy efficiency and conservation projects.

Description of the Inventions:
The inventions relate to the methods and design of software and related systems which couple amortized payment amounts with predicted and actual energy cost savings.

Features as Formulas: 1-14:
14: The formula for the periodic payment amount A is derived as follows. For an amortization schedule, we can define a function $p(t)$ that represents the principal amount remaining at time t. We can then derive a formula for this function given an unknown payment amount A and $r = 1 + i$

$$p(0) = P$$
$$p(1) = p(0)r - A = Pr - A$$
$$p(2) = p(1)r - A = Pr^2 - Ar - A$$
$$p(3) = p(2)r - A = Pr^3 - Ar^2 - Ar - A$$

$$p(t) = Pr^t - A\sum_{k=0}^{t-1} r^k$$

Applying the substitution:

$$\sum_{k=0}^{t-1} r^k = 1 + r + r^2 + \ldots + r^{t-1} = \frac{r^t - 1}{r - 1}$$

After substitution and simplification we get

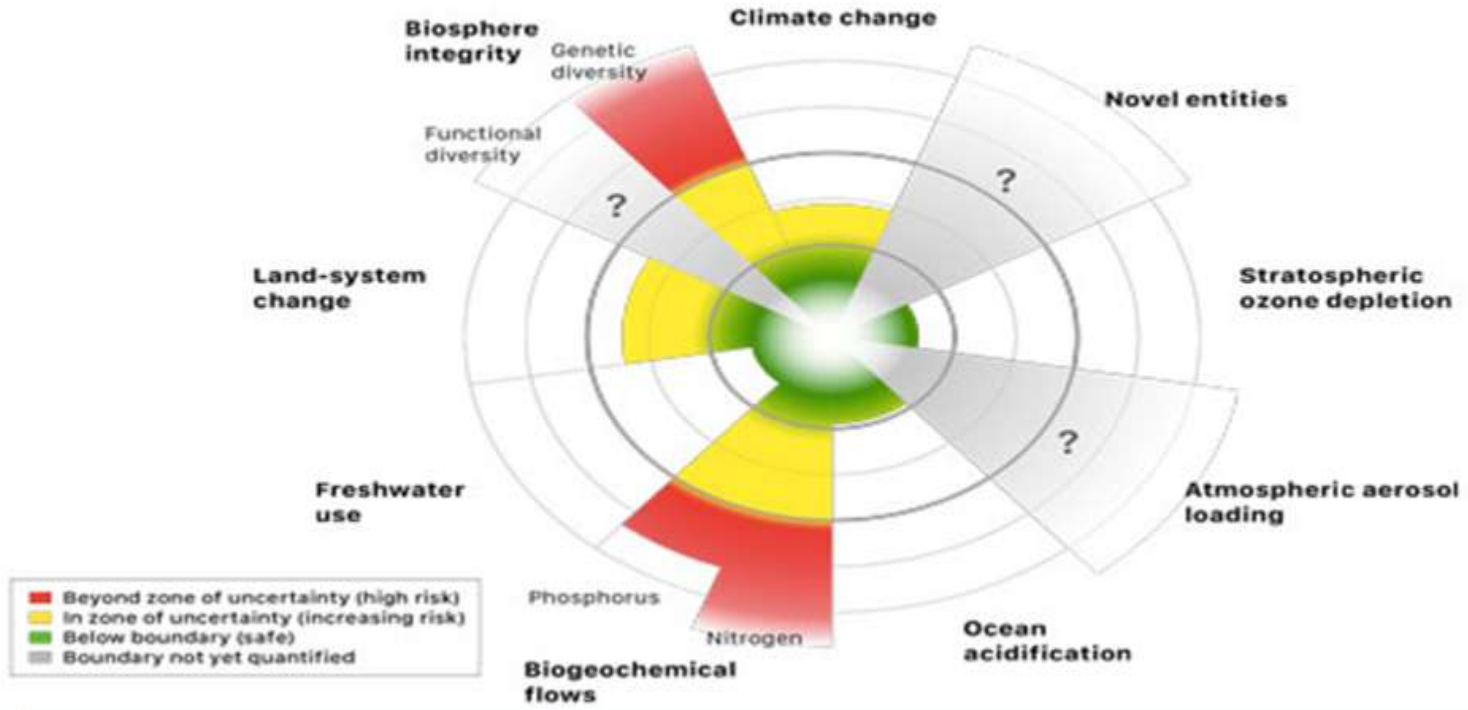
$$\frac{p(t)}{P} = 1 - \frac{(1+i)^t - 1}{(1+i)^n - 1}$$

The annuity formula is:

$$A = P\frac{i(1+i)^n}{(1+i)^n - 1} = \frac{P \times i}{1 - (1+i)^{-n}} = P\left(i + \frac{i}{(1+i)^n - 1}\right)$$

A dangerous situation

Four of nine planetary boundaries have been crossed: climate change, loss of biosphere integrity, land-system change, altered biochemical cycles
(from the Stockholm Resilience Center)



We need a

Green Industrial Revolution!

Climate Change

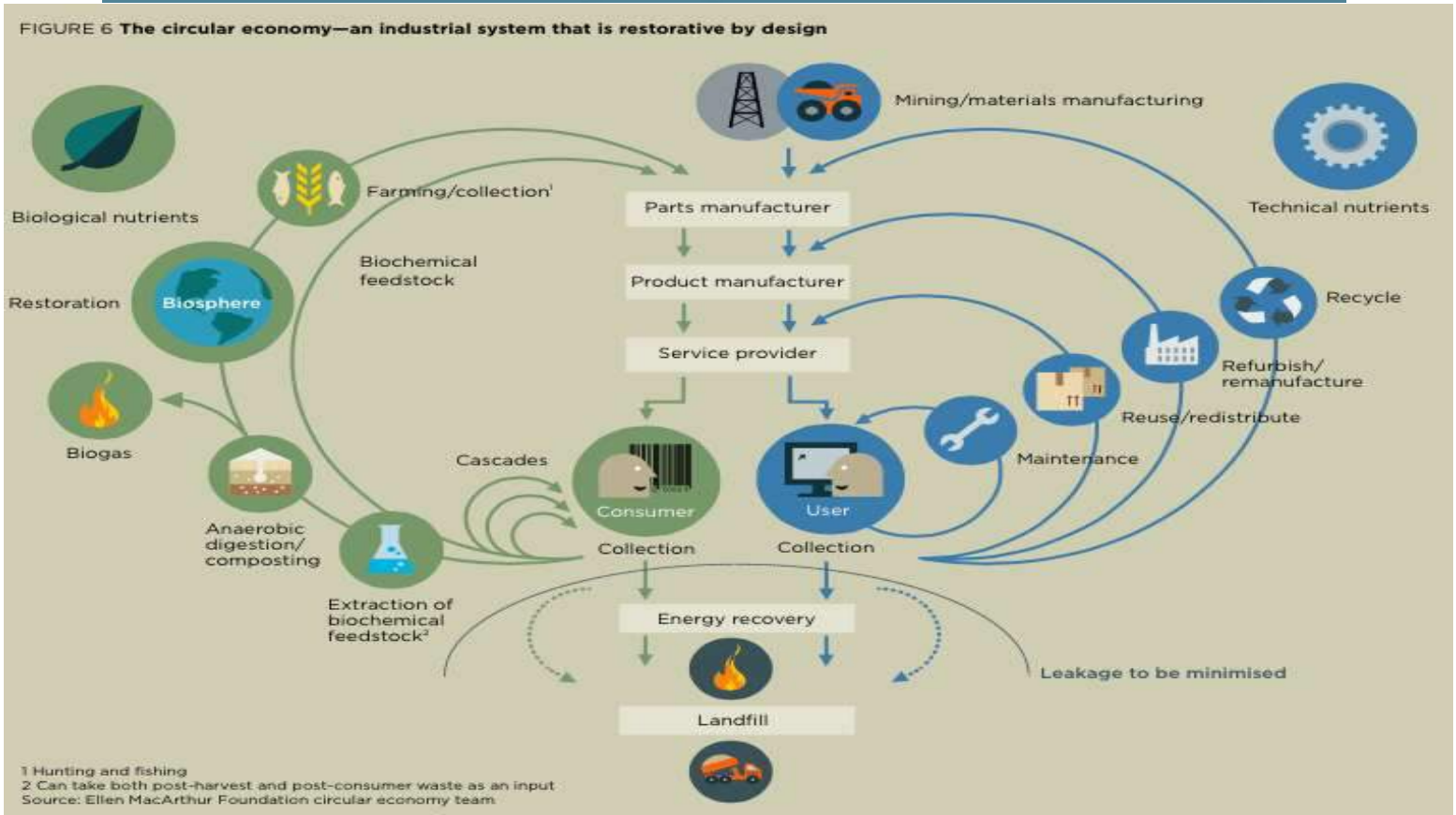
Eco systems integrity

Natural Resources Consumption

Societal Challenges

CIRCULAR ECONOMY

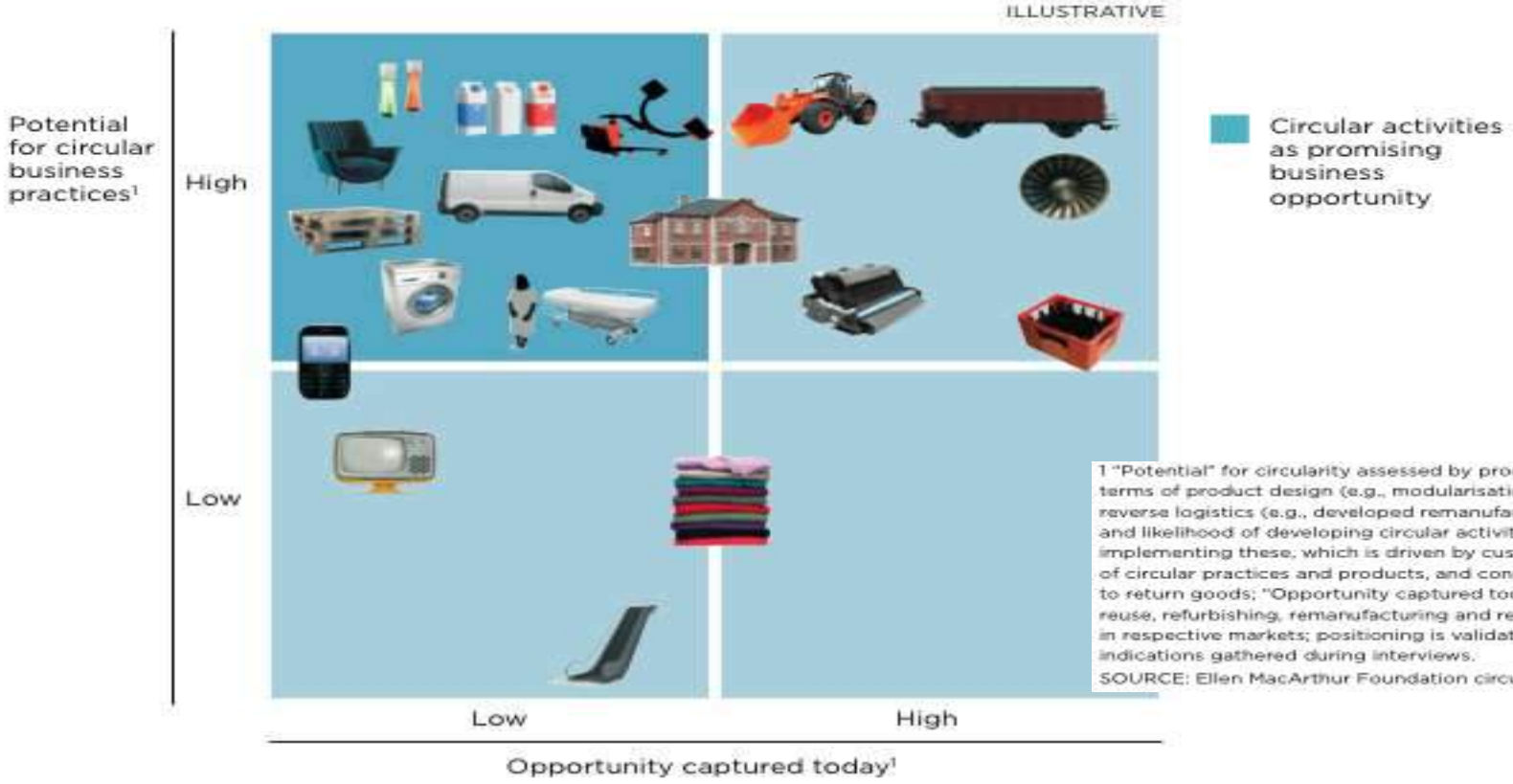
From linear to circular
Accelerating a proven concept



An economic opportunity worth billions
Charting the new territory

FIGURE 17
Increasing circular activities is a promising business opportunity for a variety of products

ILLUSTRATIVE



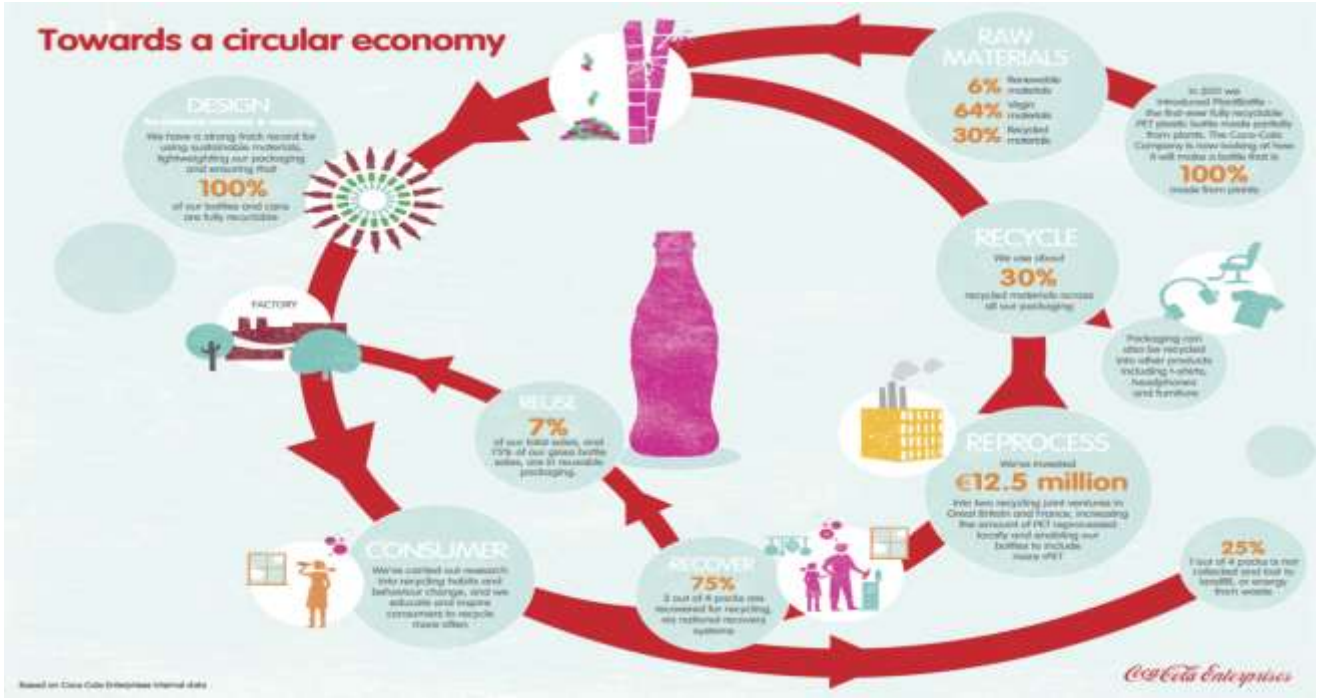
1 "Potential" for circularity assessed by product's suitability in terms of product design (e.g., modularisation, non-toxicity), reverse logistics (e.g., developed remanufacturing activities) and likelihood of developing circular activities; and by ease of implementing these, which is driven by customer acceptance of circular practices and products, and convenience/incentive to return goods; "Opportunity captured today" is driven by reuse, refurbishing, remanufacturing and recycling activities in respective markets; positioning is validated by expert indications gathered during interviews.

SOURCE: Ellen MacArthur Foundation circular economy team

Circular Economics in the USA

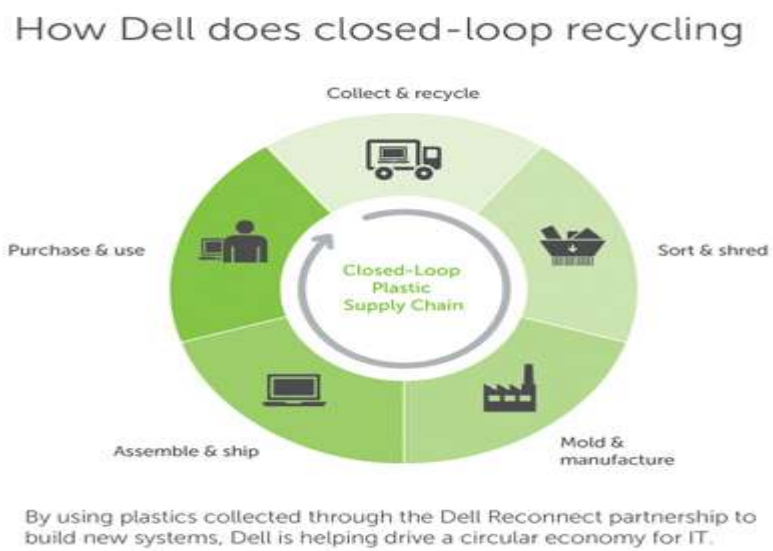
Coca Cola

Circular Economy in the Beverage Industry



Dell

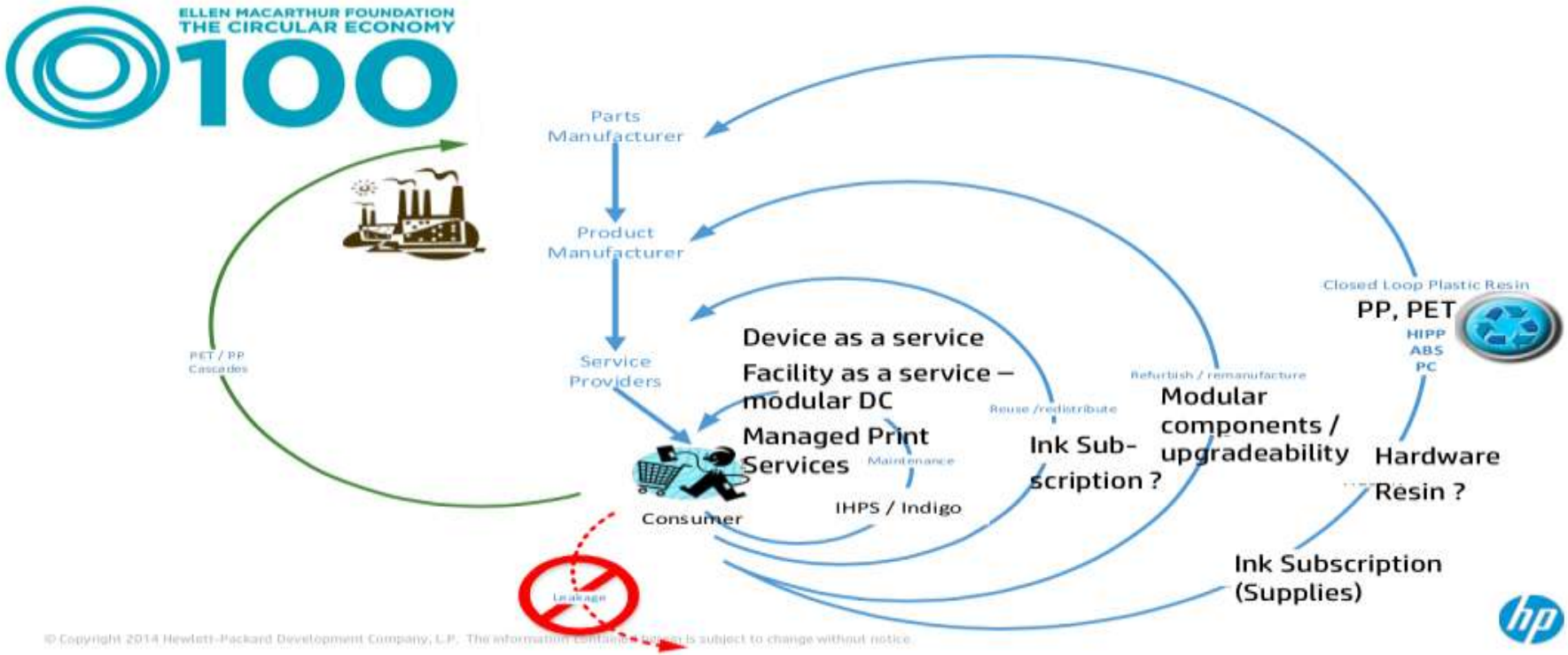
Circular Economy in the Hi Tech Industry



As the ***population grows***, more join the middle class (and adopt their consumption habits) and ***pressure on natural resources increases***, we all must look at new ways of doing things. That includes ***embracing a circular economy where all materials are valuable and the concept of "waste" is designed out of the system***. Dell is committed to making this shift easy, efficient and productive for our customers.

Hewlett Packard

Circular Economy in Hi Tech Industry



Source: Ellen MacArthur Foundation

Circular economy – a definition

The Circular Economy encompasses a system that is restorative or regenerative by intention with design that eliminates waste.

As an alternative to the linear approach (design, make, use, discard), HP believes that connecting circular economy principles to resource efficiency is the route to success.

DaaS for SMBs

Launched in June 2014 for micro/small businesses

Product simplicity:

- Subscription is simpler than subscribing to components separately

Product affordability:

- Subscription is cheaper or equal than buying the PC upfront (fair market value)

Up-to-date technology:

- Includes the latest products from HP (hardware, software and service)

CISCO

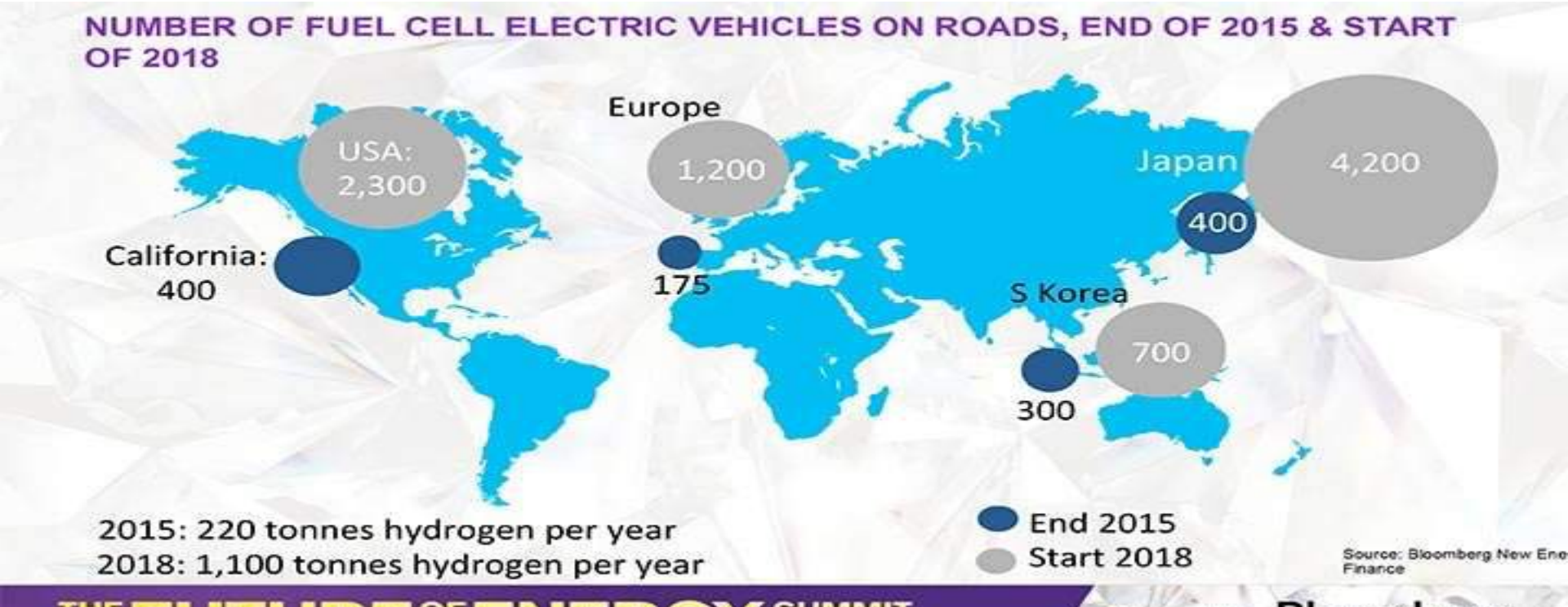
Circular Economy in the Hi Tech Industry

Develop information technologies and education that enable the circular economy at scale: Teardown Labs

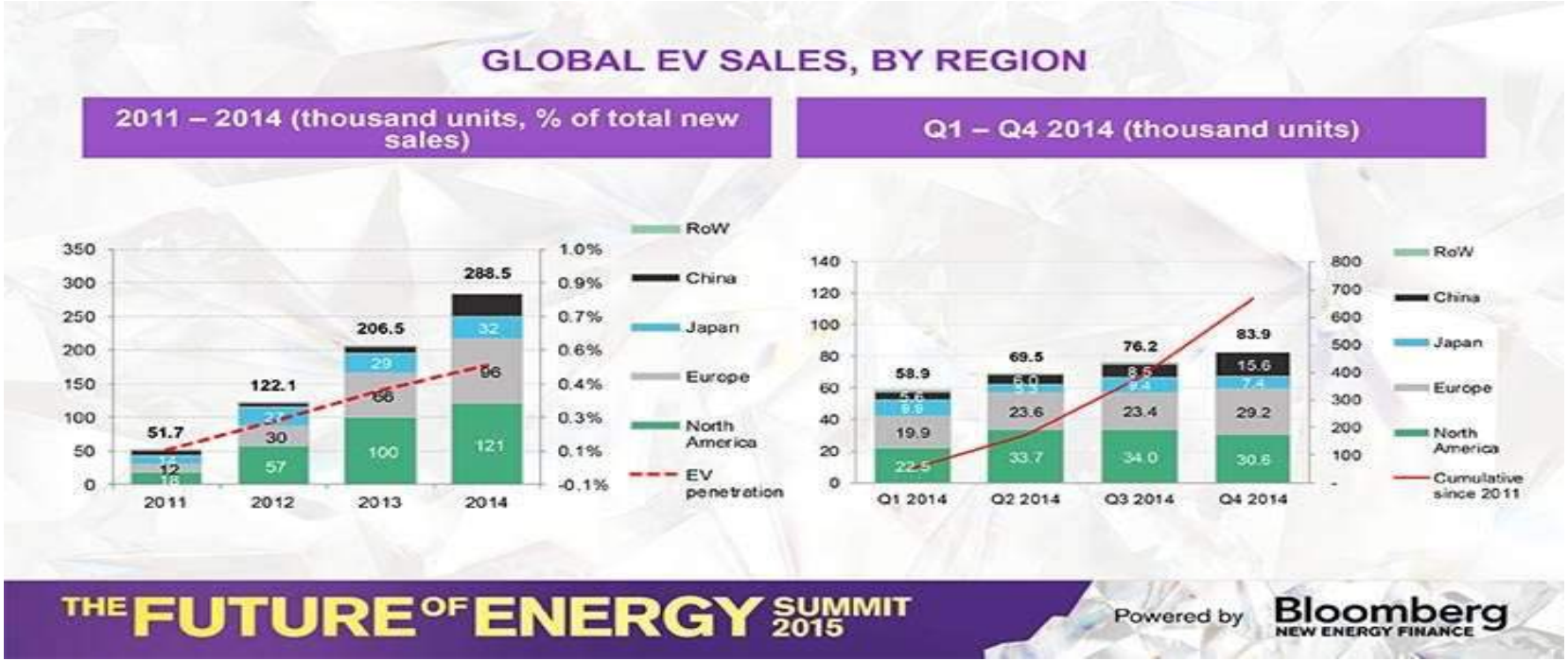
Teardown Labs at the Cisco UK Headquarters Training: where employees engaged in a hands-on workshop in which they disassembled some of the manufacturers well-know products, and after learning more about the circular economy framework and industry case studies, suggested ways that the products and the systems in which they fit; could be re-designed for a future of volatile energy and materials prices.

Circular Economy and Transportation Mobility:

Fuel-Cell Cars Are Moving Out of the Lab and Onto the Streets



Electric Vehicle Sales Quintupled in Four Years



Solar Hydrogen Station Technology

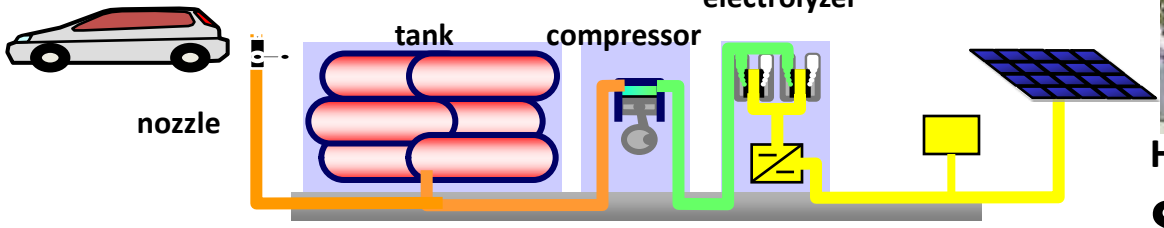
Unique Honda Designed

Electrolyzer (PEM type)

Hydrogen

Renewable Electricity

Water



Honda Produced

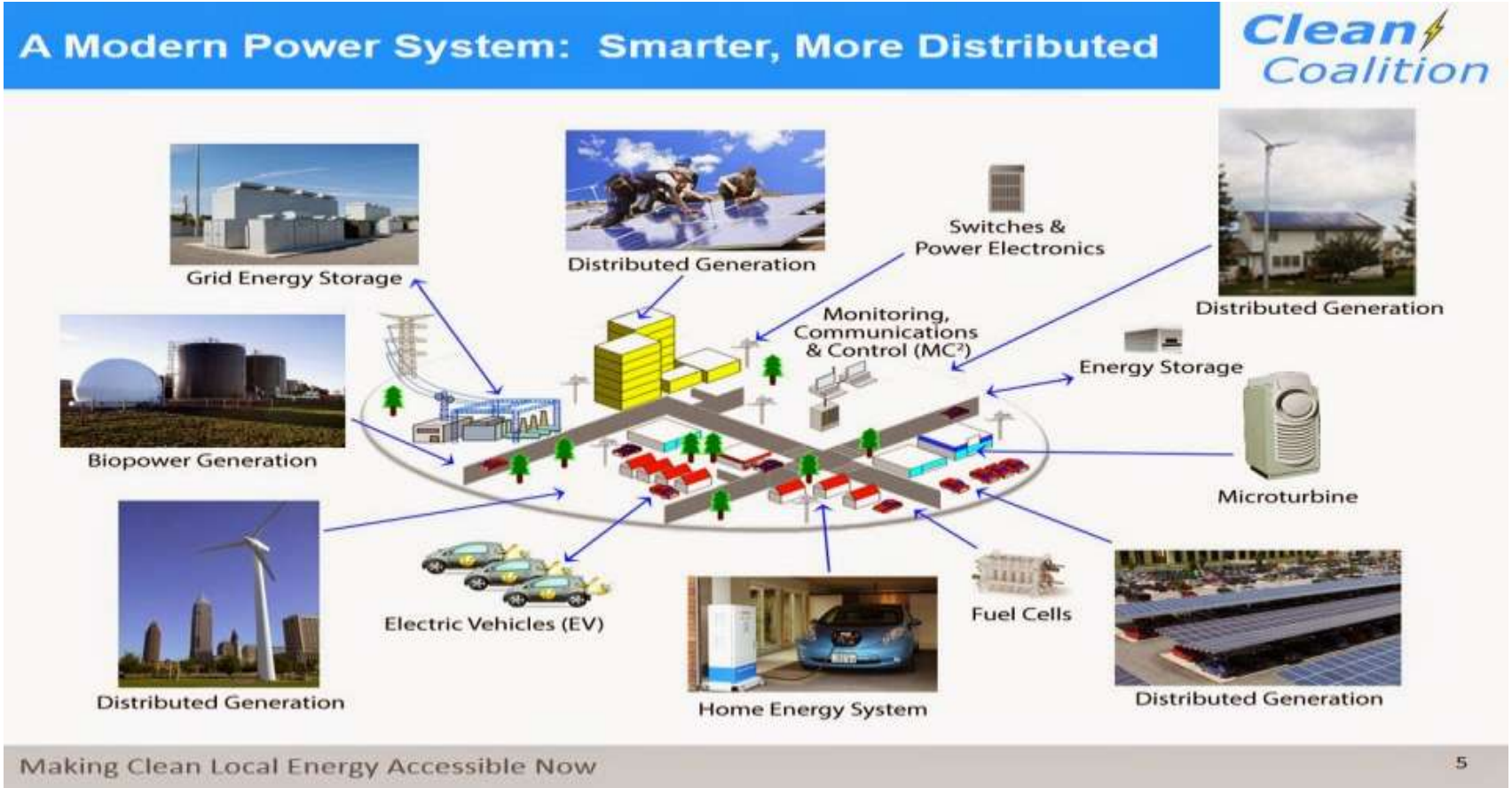
Solar Cells (CIS type)

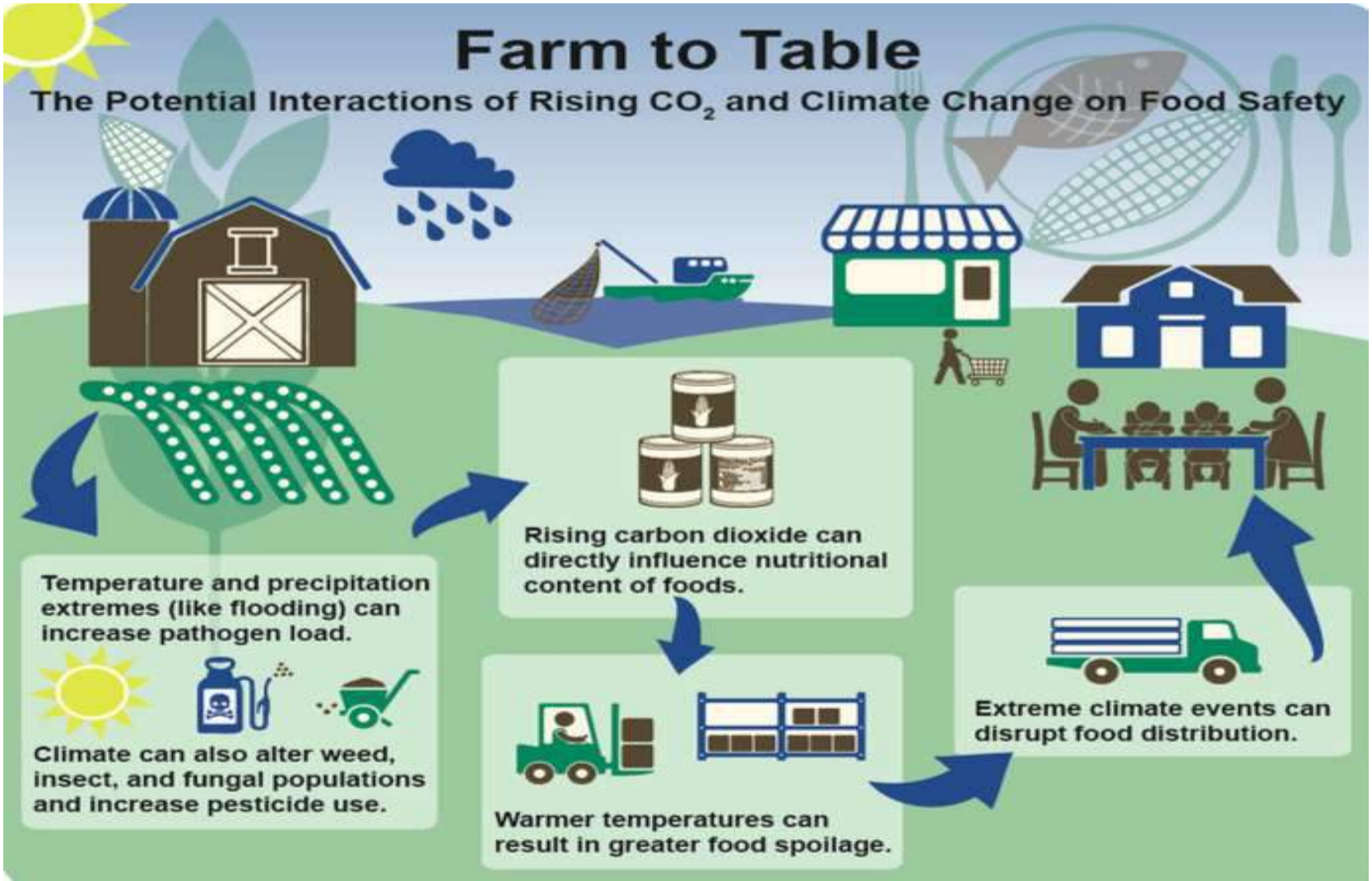
Circular Economy and Sustainable Communities

Chapter #8: Google -- Recharging Car (1.6MW) Solar Campus

Goal: carbon neutral by December 2007 -- Done

Smart Green Cities: Circular economy distributed on-site power




Farm to Table
The Potential Interactions of Rising CO_2 and Climate Change on Food Safety
Temperature and precipitation extremes (like flooding) can increase pathogen load.
Climate can also alter weed, insect, and fungal populations and increase pesticide use.
Rising carbon dioxide can directly influence nutritional content of foods.
Warmer temperatures can result in greater food spoilage.
Extreme climate events can disrupt food distribution.

Circular Economy at Home in the Family

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CSST Cross-disciplinary Scholars in Science and Technology UCLA

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