

SUSTAINABLE REDESIGN

a presentation to

CASCADE DESIGNS | Therm-A-Rest

TEAM //

Craig Johnson
Nadine Kümmel
Kate Mohn
Shari Welsh



MCAD Sustainable Design Program

Welcome //

The Team



Craig Johnson

Sustainability Graphic Designer



Shari Welsh

Creative Strategist / Marketing Communications



Kate Mohn

Executive Assistant to the President at MCAD and Special Projects Manager



Nadine Kümmel

Product Designer / Interior Architect



Presentation Agenda //

- Welcome
- What is Sustainability?
- Product and System Analysis
- Design Challenges
- Concepts
- Results



Sustainability //

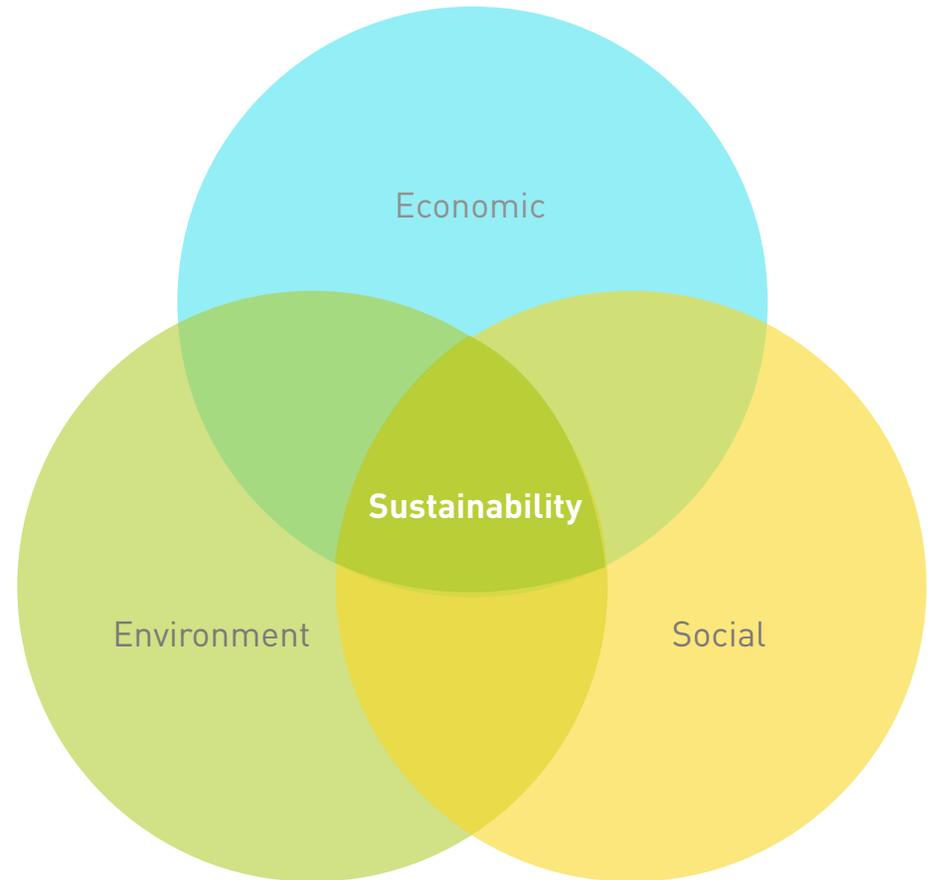
Defined

“(Use and) development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

- Brundtland Commission (1987)

“Don’t do things today that will make tomorrow worse.”

- Nathan Shedroff, *Design is the Problem*



Levels of Sustainability //

Step by Step



Organizations usually go through phases in understanding sustainability and their role in it.

Sustainability 1.0, is mostly about cleaning up messes: reducing impacts, dealing with any public relations debacles and assessing risks.

In **Sustainability 2.0**, sustainability becomes a source of competitive advantage or an enabler of other objectives: improved image, financial savings, improved stock price and new products and services. At some point though, organizations experience a major epiphany, realizing their efforts are clearly not enough to achieve sustainability.

Sustainability 3.0 involves challenging the business model and taking responsibility for a serious world or community problem that an organization is well positioned to help solve.

Organizations broaden their focus from just serving customers (making products and services) to solving sustainability challenges in the larger community. It's no longer about making cool products; the mission becomes one of solving world problems.¹



Sustainability //

Level 2.0 and better

Timberland

Developed a Green Index® rating system. Includes the rating on every one of its products.*

Products are measured on the

- Climate impact
- Chemicals used
- Resource consumption

The company also reports on its ecological footprint.**

- 15% Renewable energy
- 94.7% PVC-free footwear
- 59.2% Recycled, organic or renewable products
- 3,557,721 Trees planted by employees

This type of transparent reporting can contribute significantly to brand loyalty.



* <http://community.timberland.com/Earthkeeping/Green-Index>
**<http://community.timberland.com/earthkeeping/our-footprint>

Nike

Nike has undertaken several major initiatives to increase the sustainability of its operations:

- compiling a list of restricted substances to avoid in the design process
- monitoring its supply chain for worker abuses
- developed the Materials Sustainability Index (MSI), a cradle-to-grave assessment tool backed by life cycle assessment data

The MSI was produced by the company after eight years of research and has now been made available to the public free of charge. We utilized the MSI regularly during the assessment of the Mira and NeoAir product, as it is the best tool currently available for textile life cycle assessment.



<http://www.nikeresponsibility.com/report/content/chapter/our-sustainability-strategy>

Patagonia

Product

- Created The Footprint Chronicles® to create transparency about its supply chain, in order to help reduce their adverse social and environmental impacts on an industrial scale
- Use of e-fibres

Common Threads Program (reduce, reuse, repair, recycle, reimagine)

- Created a Product Care Guide: Preserving your Gear from A to Z
- Today, you can return any Patagonia product to the company and they will reuse it, recycle it into new fabric or make it into a new product.

Social

- Promotes fair labor practices and safe working conditions throughout its supply chain



<http://www.patagonia.com/us/environmentalism>

Sustainable Redesign //

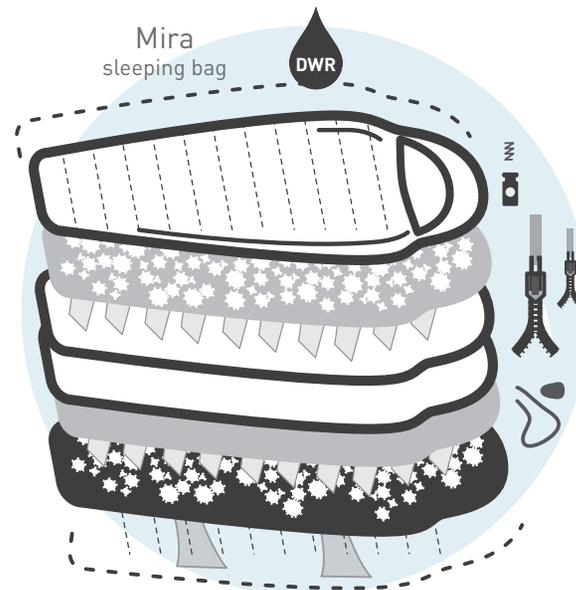
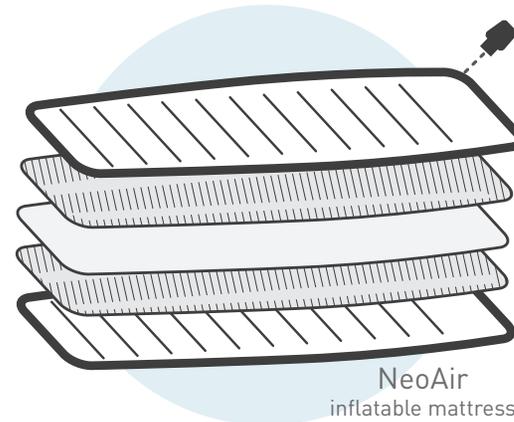
Therm-a-Rest Mira + NeoAir System

12.12.13 // MCAD // Collaborative Product Design



Product Breakdown //

Mira Sleeping Bag and
NeoAir Sleeping Pad



Design Brief //

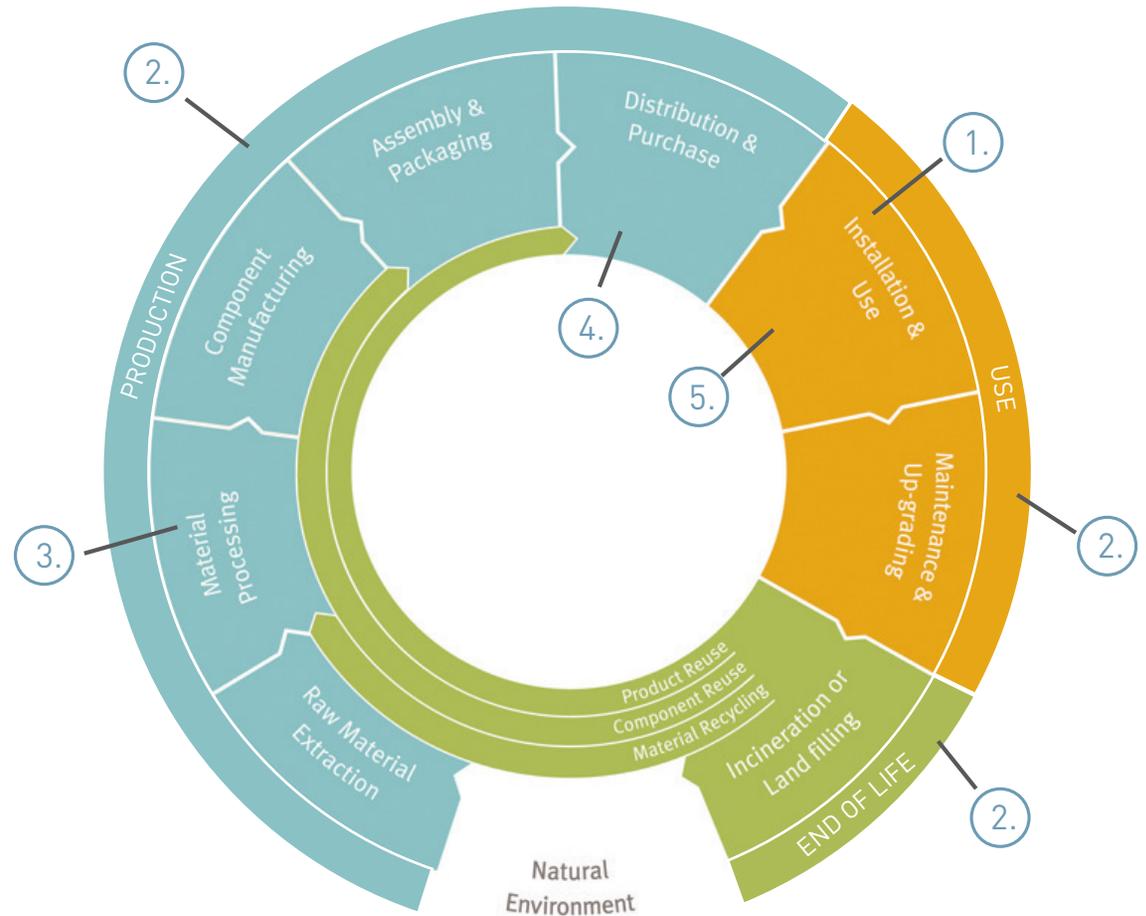
Priorities

SUSTAINABILITY PRIORITIES

1. Extend product life—**by 8 yrs.**
2. Impact reduction—**reduce overall impacts by 50%**
3. Remove DWR (durable water repellent) from SBOM—**find 100% replacement for DWR**

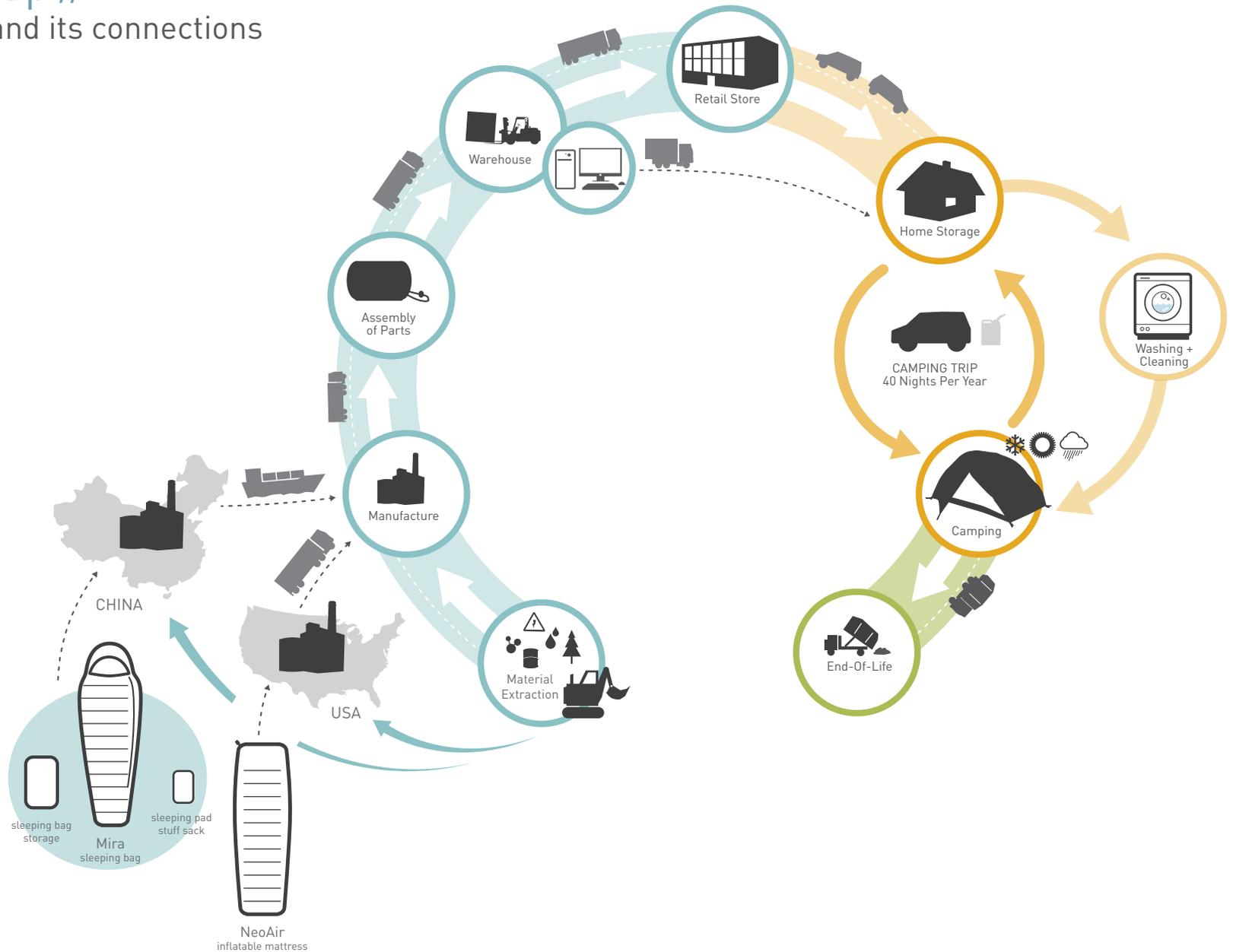
BUSINESS PRIORITIES

4. Price increase of **10%** or less
(increase allowed if performance is improved or impact is reduced)
5. Maintain performance (within $\sim 5^\circ$ F and no greater than 3 oz. weight increase)



System Map //

The product and its connections



Sustainable Redesign //

Therm-a-Rest Mira + NeoAir System

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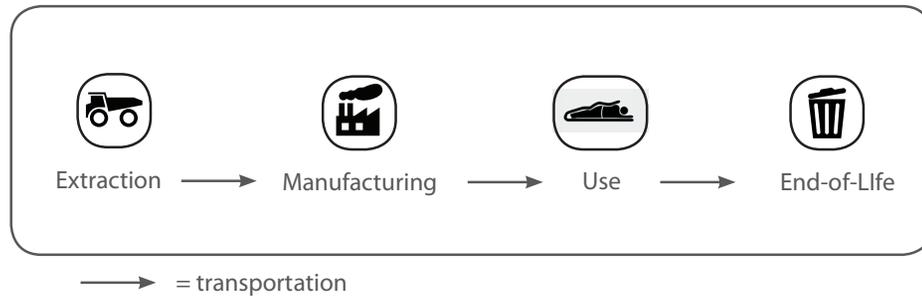
9

Craig Johnson
Nadine Kümmel
Kate Mohn
Shari Welsh



Life Cycle Assessment // Measurements

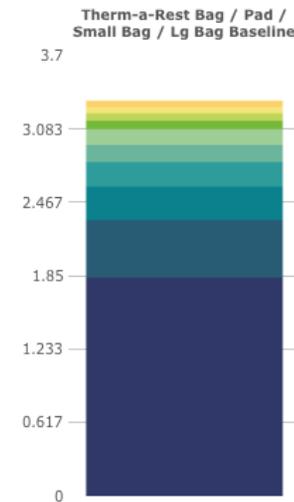
PROJECT BOUNDARIES



FUNCTIONAL UNIT // Lifetime use

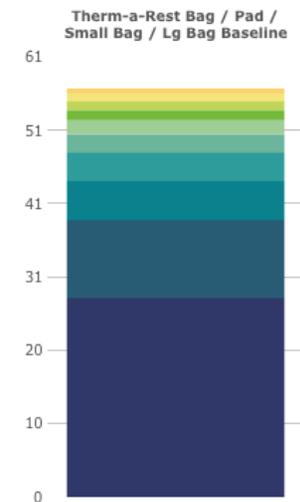
- 6,400 hours use sleeping bag, pad and 2 storage bags (8 hours per day x 40 times per year)
- ***Lifetime of Mira sleeping bag is assumed to be 20 years** while **NeoAir sleeping pad is assumed to be 4 years**, so the NeoAir sleeping pad and storage bag are multiplied x5 to equal the life of the Mira sleeping bag.
- See Appendix A for full list of assumptions

PRODUCT LIFE CYCLE ASSESSMENT BASELINE //



Total = 3.7mPts/func unit

Input	mPts/func unit
Van, <3.5t	1.84
Nylon 6	0.484
Polyester fabric	0.281
Polyester fabric	0.206
Truck, 20-28t	0.146
Polyester fabric	0.133
Polyester fabric	0.0700
Polyester fabric	0.0618
Polyethylene terephthalate, granulate, amorphous, PET	0.0544
Nylon 6	0.0524



Total = 61 CO₂ eq. kg/func unit

Input	CO ₂ eq. kg/func unit
Van, <3.5t	27.6
Nylon 6	10.8
Polyester fabric	5.40
Polyester fabric	3.95
Polyester fabric	2.56
Truck, 20-28t	2.02
Polyester fabric	1.34
Polyester fabric	1.19
Nylon 6	1.18
Polyester fabric	0.659



Design Challenges //

Different perspectives

- **Cradle to Cradle** - Rate the product according to the Cradle to Cradle certification system
- **Energy** - Develop ideas to improve the energy efficiency of the product
- **Lightweighting** - Explore ways to reduce the amount of material the product uses
- **Product-to-service** - Turn the product into a service
- **Biomimicry** - Draw inspiration from nature to solve a design challenge with the product
- **Material effectiveness** - Research material substitutions for the product
- **Persuasion** - Incorporate principles of persuasive design into the product

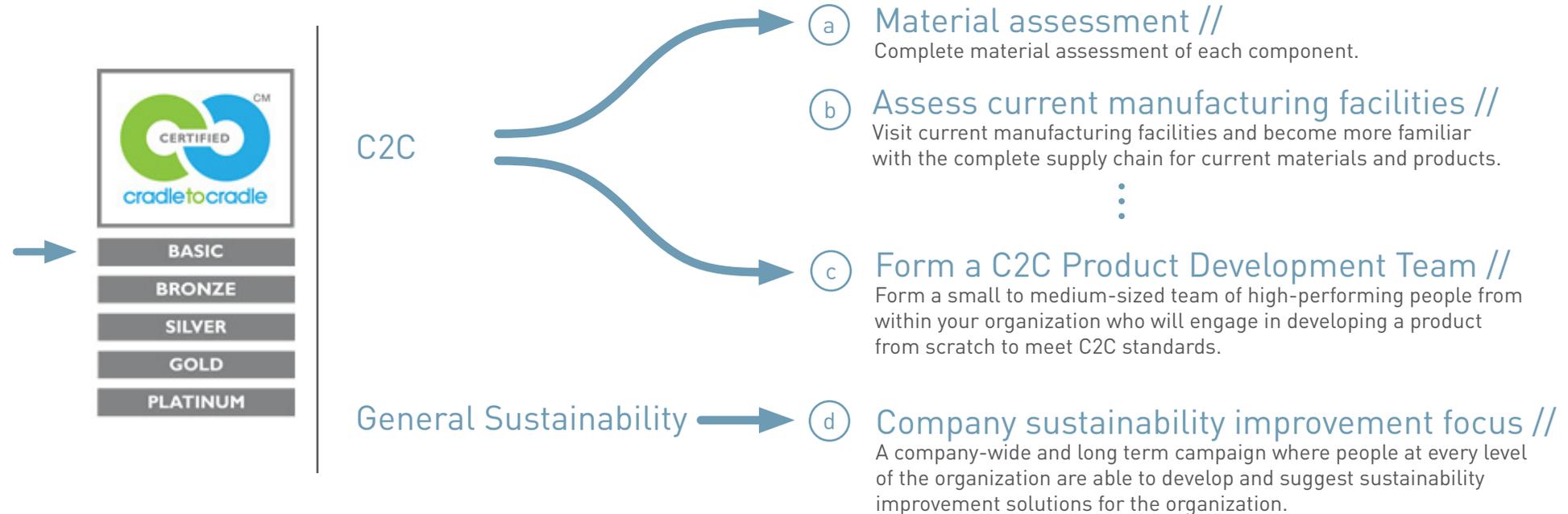


● Cradle to Cradle //

Baseline Requirements for C2C Basic Certification //

- Complete ingredient formulations for all materials used in the product
- Recycled content and weight of all materials used in the product
- Annual energy required for manufacture of product and source(s) of that energy
- Water stewardship guidelines document
- Fair labor / corporate ethics guideline document

Detailed company assessment - Appendix B



● Energy // Improving energy efficiency

Car-share service



contest to challenge users to get to their campsite car-free; people post their adventures on social media

provide checklist of best-practices for car-sharing

cross-promote with car-sharing companies

give a ride-share coupon with every product

educate end-user about transit options that reduce carbon footprint

overall impact improvement

13% indirect idea

Reduce solo travel to campsite

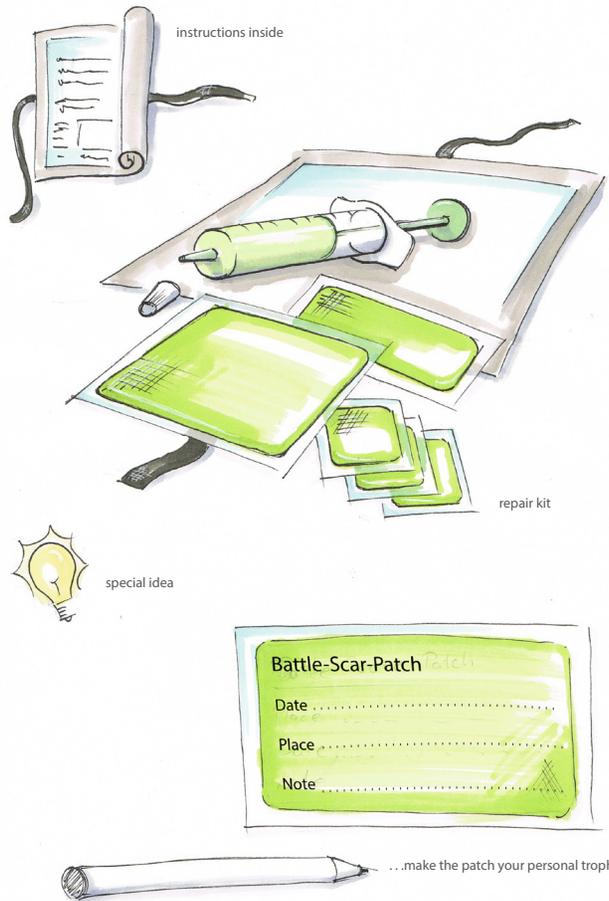
Assumption: Reduce miles driven during lifetime of product by 25%



● Energy //

Improving energy efficiency

Battle-scar patch - Tell your Adventure Story



Offer Repair Kit-make it a trend

Assumption: 25% increase in lifespan of NeoAir



● Lightweighting //
Reducing material



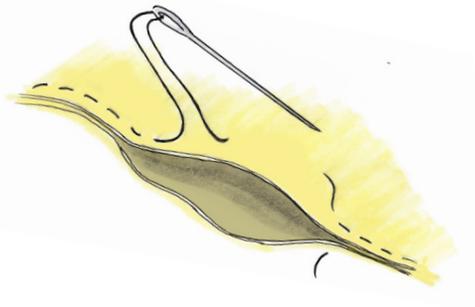
Remove the stuff sack for the NeoAir Sleeping Pad

Eliminate the small stuff sack for the NeoAir Sleeping Pad entirely
and use sack from Mira sleeping bag for both products



● Product-to-Service //

Turning the product into a service

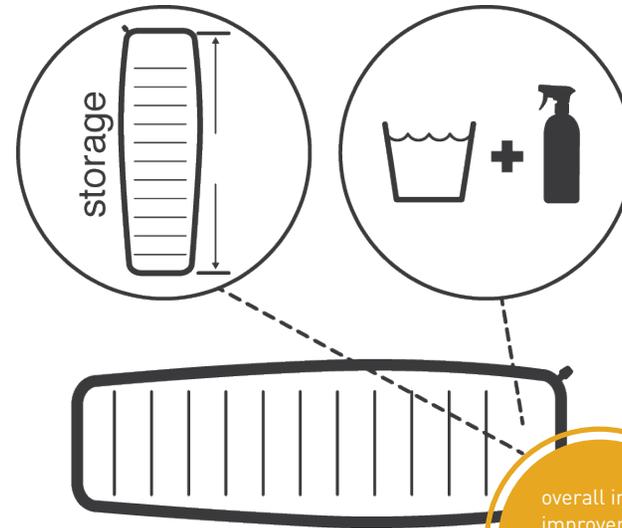


overall impact improvement
25%
indirect idea

Create or promote repair service

Partner with outdoor retailers

Assumption: this service would increase the life of both the sleeping pad and sleeping bag by 25%



STORAGE:
CARE:
WASHING:
USE:

overall impact improvement
9.2%

Screen-printing detailed care instructions directly onto the sleeping bag

Assumption: increase in useful life of the sleeping bag (but not the pad) by 25%



overall impact improvement
25%
indirect idea

The Gear Shed: Co-op/time-share

Assumption: increase the life of both the sleeping pad and sleeping bag by 25%

Sustainable Redesign //

Therm-a-Rest Mira + NeoAir System

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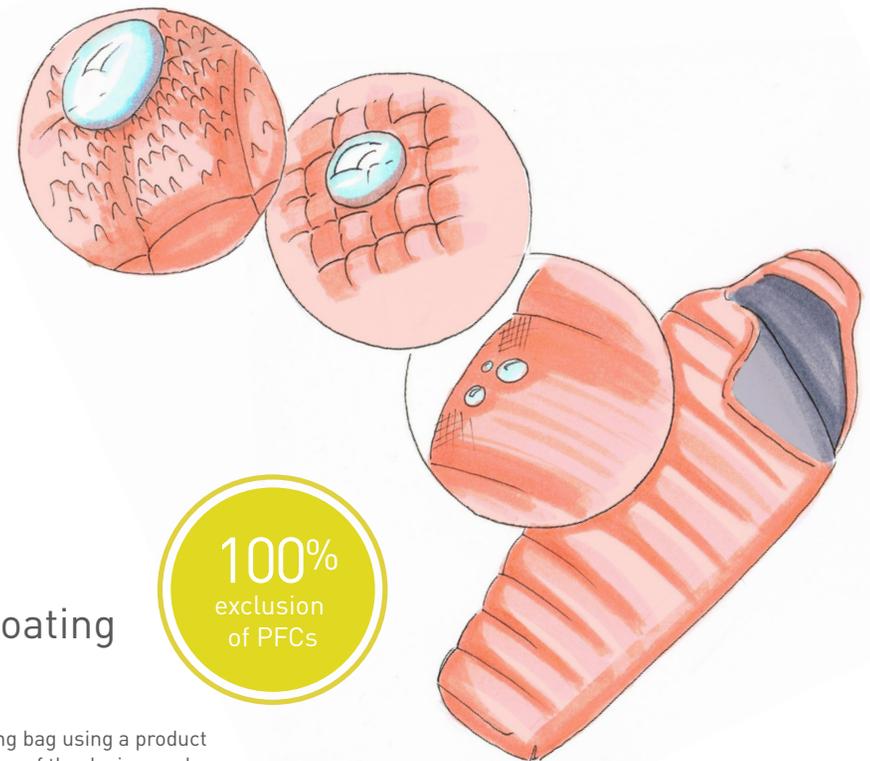
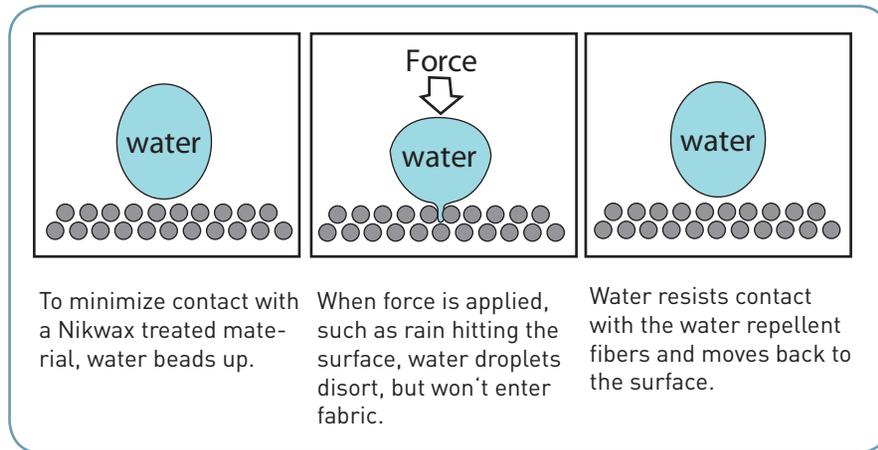


Biomimicry //

Waxy surface repels water

Plants and animals have been using waxy and oily surfaces to repel water for millions of years. The inspiration for our winning biomimetic design application is from the waxy polymers that are found on the plant cuticle of succulents, which form an impermeable layer for water.

Nikwax coating schematic



Recommendation: Nikwax coating

Meeting upcoming regulations the EU

In addition, if the customer is able to recoat their sleeping bag using a product like Nixwax, they would conceivably be able to achieve two of the design goals with one material - 1) removing DWR and 2) extending the life of the product.

[source for quote: <http://www.nikwax-usa.com/en-us/environment/fluorocarbons.php>]



● Material Assessment // Replacement

100% Recycled Polyester to replace all polyester components: ○

Polyester comprises approximately 25% of the Mira/NeoAir product system.

Companies to consider for recycled polyester

Teijin® // www.nau.com/about/business-unusual/our-fabrics/recycledpolyester.html

Sympatex // <http://www.sympatex.com>

Additional material replacement opportunities can be found in Appendix C

8.3%
environmental
impact
improvement

“simply increasing the amount of clothing that is collected and reused or remade could generate \$71 billion in material savings (worldwide).”²



*NOTE: Sustainable Minds does not include recycled polyester as a textile option. However, the Materials Sustainability Index (MSI) [[link: http://msi.apparelcoalition.org/#/](http://msi.apparelcoalition.org/#/)] rates recycled polyester 19% better than virgin polyester. Therefore, we extrapolated that information into Sustainable Minds by totaling the weight of all the polyester components and reducing it by 19% to simulate the 19% reduction in the material impact of the polyester components one would expect if switching from virgin to recycled polyester.

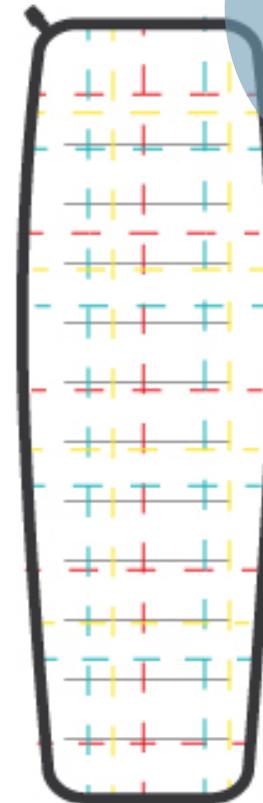
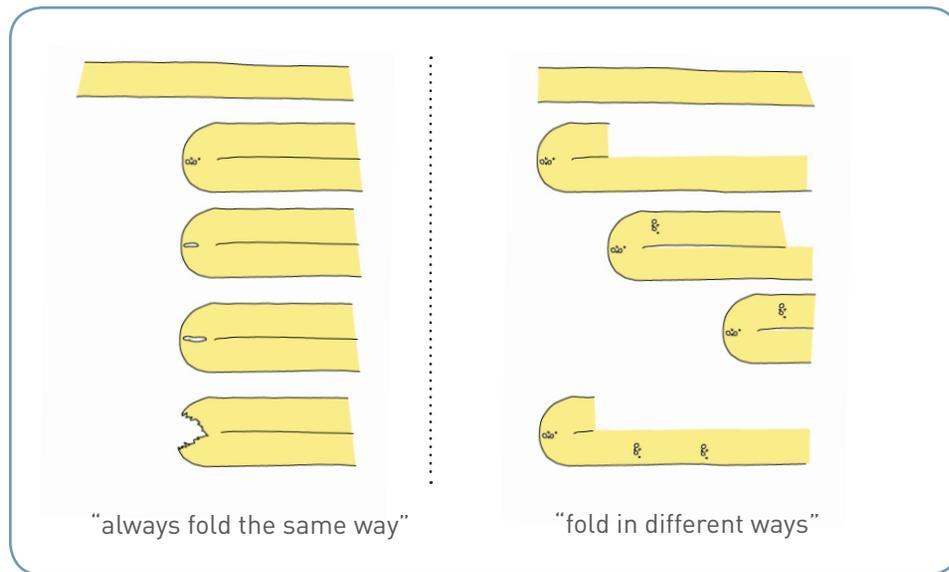


Persuasion // Persuasive design

Make a good habit easier and more convenient

Decorative seams help users to vary their folding behavior and extend product longevity

Explanation material fatigue - section view //



Make the seams different themes to make it more fun to fold the mattress in different ways

Describe how to fold directly on product

Provide tips for gear care on website

Create video to show how stress points impact the material

Make a good habit easier and more convenient

overall impact improvement
16%

Patterns applied to the NeoAir

Assumption: 25% increase in lifespan of NeoAir

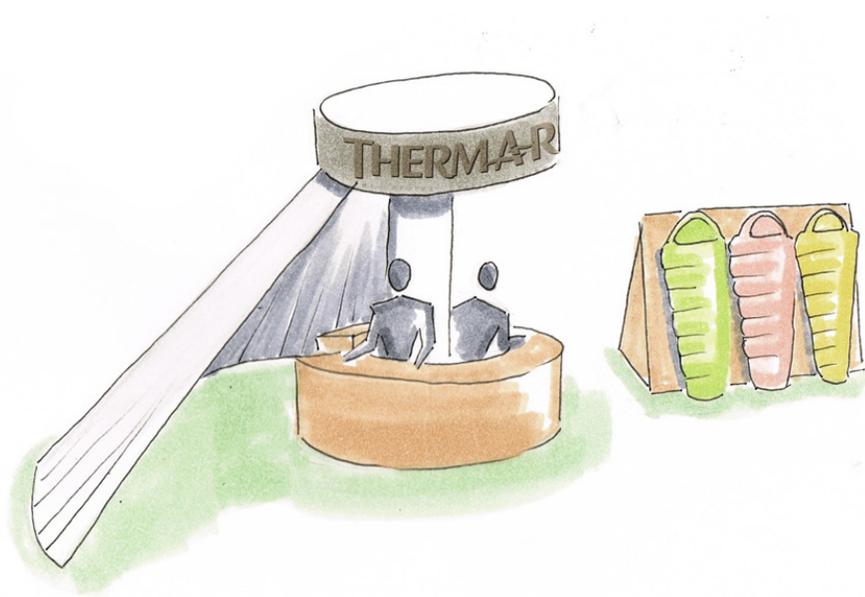


● Persuasion //

Persuasive communication

Sponsor a booth at Banff Film Festival

Demonstrate what company is doing related to sustainability



Cascade Designs could sponsor a booth at the Banff film festival or similarly-focused events to educate consumers about their products and the steps the company is taking to become more sustainable. Company representatives could answer questions related to their products, demonstrate best practices for storing and maintaining equipment, and generally serve as a resource to interested customers.



Decision Matrix //

Uncovering the best solutions

rating system of concept effectiveness

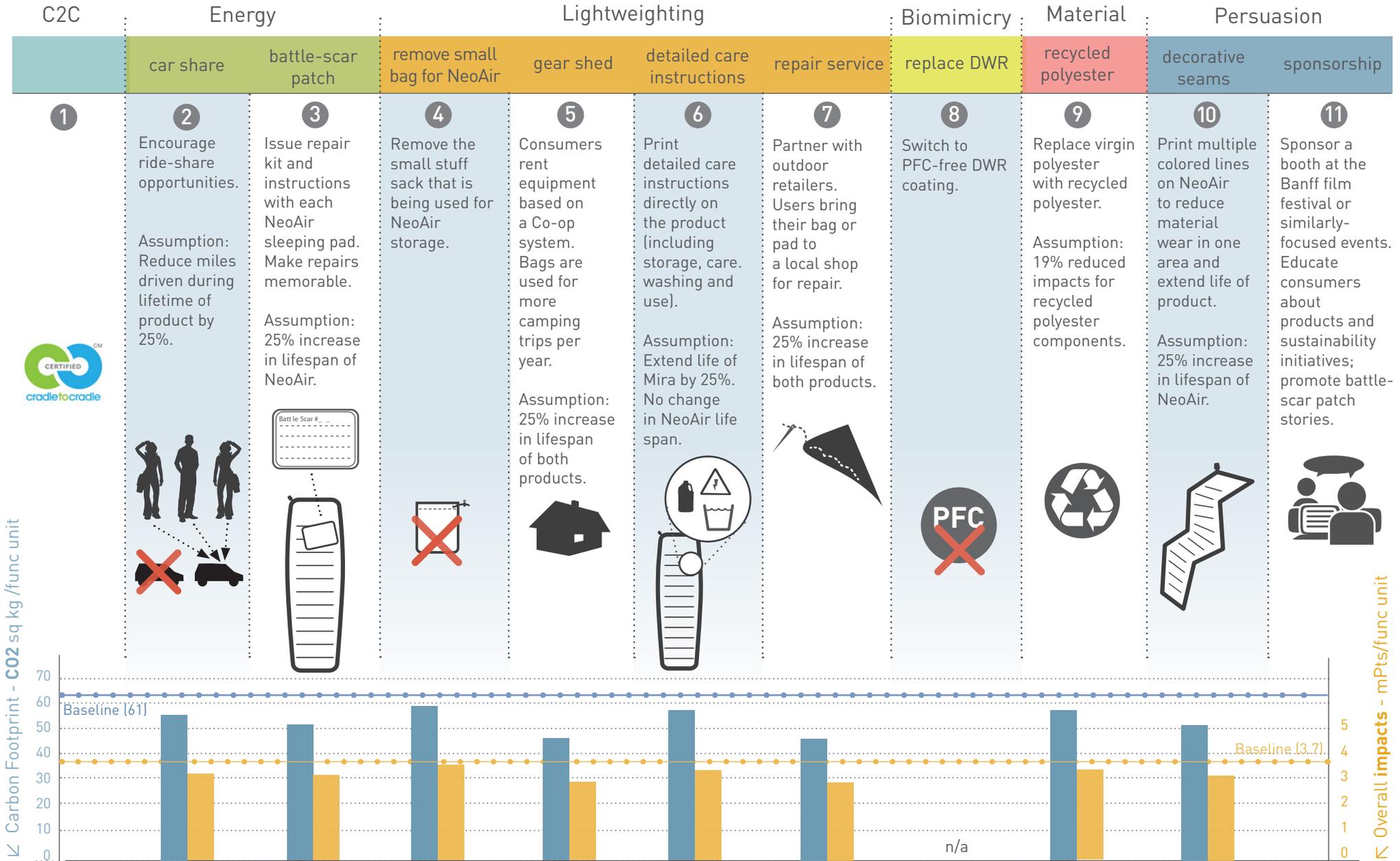
1	2	3	4	5
bad	unacceptable	neutral	good	best

Each design concept received a score based on how well it achieved each of the five design priorities. That number was then multiplied by the weight given to the priority, then totaled by column. For example// decorative seams: (5x4)+ (5x5) + (4x0) + (4x5) + (3x5) = 80

Design Priority (ranked from highes to lowest) ↓	design priority weighting	decorative seams	battle-scar patch	car share	detailed care in- structions	recycled polyester	remove small bag for NeoAir	gear shed	repair service
Extend product life — by 8 yrs.	5	3	3	0	4	0	0	4	4
Maintain performance (within -5° F and no greater than 3 oz. weight increase)	5	5	5	5	5	5	3	5	4
Find 100% replacement for DWR	4	0	0	0	0	0	3	0	0
Price increase ceiling of 10%	4	5	4	5	5	2	5	4	4
Impact reduction—reduce overall impact by 50%	3	5	5	4	4	3	3	5	5
Overall rating	--	75	71	57	77	42	44	76	71



Design Concepts – Best of the Best //



Sustainable Redesign //

Therm-a-Rest Mira + NeoAir System

12.12.13 // MCAD // Collaborative Product Design



THANK YOU

TEAM //

Craig Johnson
Nadine Kümmel
Kate Mohn
Shari Welsh



MCAD Sustainable Design Program



Sources //

page 1 // Therm-A-Rest icon sketches: Craig Johnson
page 5 // quote: ISSP "Confused about Social Sustainability?" by Darcy Hitchcock and Marsha Willard
page 8 // image source: okala.net
page 9 // icons, Craig Johnson
page 10 // designs by The Noun Project: tractor by Diego Naive; sleeping bag by Andrew J. Young; factory by Amelia Wattenberger; trash can by Björn Wisnewski
page 12 // copy and C2C certification image: <http://epea-hamburg.org/en/content/cradle-cradle>
page 12 // graphic, Nadine Kümmel
page 13 // graphic Nadine Kümmel/ Craig Johnson (basic graphic elements: <http://www.park-sleep-fly.net>; <http://www.generatorgroup.net>;
<http://www.czech-airport-bus.com>)
page 14 // sketch Nadine Kümmel
page 17 // graphic water droplets <http://www.nikwax-usa.com/en-us/environment/fluorocarbons.php>
page 17 // sketch: Nadine Kümmel
page 18 // quote: http://www.greenbiz.com/news/2013/01/29/circular-economy-saves-more-700B?page=0%2C0&mkt_tok=3RkMMJWWfF9wsRonuKXOZKXonjHpfsX56u
page 19 // sketches: Nadine Kümmel and Craig Johnson
page 19 // sketch: Nadine Kümmel
page 20 // sketch: Nadine Kümmel
page 21 // Information source: www.biblioteca.uma.es/bbldoc/articulos/16494246.pdf
page 21 // images: Wikimedia Commons, <http://z.about.com/d/houseplants/1/0/e/-/-/-/Succulent.JPG>, nanotrend.eu
page 25 // graphics: Craig Johnson
page 25 // talking designed by claire jones the noun project



Appendix A //

Additional LCA Assumptions

- **Material inputs** for the baseline LCA were based on the results of the product break-down as well as the BOM provided by Cascade Designs. In addition, the following assumptions are built into the model:
- Assume **6,400 miles of oceanic freighter travel** for sleeping bag from Hong Kong to Seattle
- Assume **2,400 miles of truck transport** (we assumed full product transportation from Seattle to the mid-West)
- **40 nights of use per year**; assume 10 trips of four days per year at 300 miles round-trip distance for each
- **One hand wash of Mira per year** for 20 years; assume 40 gallons of water (average bath tub capacity) per wash. Total water usage is 800 gallons over the life of the product.
- Assume that the product system is **disposed of via landfill** at end of life
- **No option for down in Sustainable Minds**, so not included in BOM
- **No option for PFOA in Sustainable Minds**, so not included in BOM



Appendix B // Cradle to Cradle Certification Checklist

Craig Johnson, Nadine Kuemmel,
Kate Mohn, Shari Welsh

Criteria	Required				Pessimistic/ Optimistic Score		Red bold answers are uncertain.	
	TN/BN	Silver	Gold	Plat.	Yes = 1 No = 0	Pe Op		
1.0 Materials								
1	All material ingredients identified (down to the 100 ppm level)	x	x	x	x	0	0	01. The company does not have BoMs with materials identified to 100ppm level for the Mira or NeoAir [source: Jim Giblin, Cascade Designs]
2	Defined as biological or technical nutrient	x	x	x	x	0	1	02. There is a fairly clear delineation between biological nutrients (mainly the down used for lining) and the technical nutrients that comprise most of the BoM, such as polyester, nylon, silicone, and vinyl. However, there may be additional biological or technical nutrients that are not currently being identified in the BoM.
3	All materials assessed for their intended use and impact on Human/Environmental Health according to the following criteria:	x	x	x	x	0	0	03-06. Sustainable Minds LCA software assesses product materials and then rates the results for human health effects. Currently carcinogens are listed as the largest human health impact for the products we analyzed.
4	Human Health: Carcinogenicity, Endocrine Disruption, Mutagenicity, Reproductive Toxicity, Teratogenicity, Acute Toxicity, Chronic Toxicity, Irritation, Sensitization	x	x	x	x	0	0	07. The company has concerns about several aspects of the user's experience with the product, but currently there are no plans in place to address the issues of materials that may be environmentally damaging. [source: Jim Giblin, Cascade Designs]
5	Environmental Health: Fish Toxicity, Algae Toxicity, Daphnia Toxicity, Persistence/Biodegradation, Bioaccumulation, Ozone Depletion/Climatic Relevance	x	x	x	x	0	0	08. The company is working on addressing the issue of DWR coating in light of upcoming known and potential bans within the EU. However, it is not currently formulating a plan to address other potentially problematic material impacts. [source: Jim Giblin, Cascade Designs]
6	Material Class Criteria: Content of Organohalogenes, Content of Heavy Metals	x	x	x	x	0	0	09. Materials have not been assessed to this level.
7	Strategy developed to optimize all remaining problematic ingredients/materials	x	x	x	x	0	0	
8	Product formulation optimized (i.e., all problematic inputs replaced/phased out)	x		x	x	0	0	
9	Meets Cradle to Cradle emission standards			x	x	0	0	
2.0 Material Reutilization / Design For Environment								
10	Defined the appropriate cycle (i.e., Technical or Biological) for the product and developing a plan for product recovery and reutilization	x	x	x	x	0	0	10-12. Cascade Designs has no end-of-life program for these products. [source: Jim Giblin, Cascade Designs]
11	Well defined plan (including scope and budget) for developing the logistics and recovery systems for this class of product			x	x	0	0	
12	Recovering, remanufacturing or recycling the product into new product of equal or higher value				x	0	0	
13	Product has been designed/manufactured for the technical or biological cycle and has a nutrient (re)utilization score →= 50	x	x	x	x	0	0	13-15. Jim Giblin / Cascade Designs: "none of the materials are from recycled content." Additionally, the C2C certification guidelines clearly state that "a material must be easily separable to be considered recyclable." Our experience with the product tear down indicates that none of the individual components of the bag or sleeping pad are currently easily disassembled and, therefore, fall outside the C2C definition of recyclability.
14	Product has been designed/manufactured for the technical or biological cycle and has a nutrient (re)utilization score →= 70			x	x	0	0	
15	Product has been designed/manufactured for the technical or biological cycle and has a nutrient (re)utilization score →= 85				x	0	0	
3.0 Energy								
16	Characterized energy use and source(s) for product manufacture/assembly		x	x	x	0	0	16. The company has not yet taken these steps. [source: Jim Giblin, Cascade Designs]
17	Developed strategy for using current solar income for product manufacture/assembly		x	x	x	0	0	17-19. Washington State (where the company has its headquarters) uses a higher amount of hydroelectric energy than many other states, but the company does not appear to have done any special planning related to this. The company was not able to provide any information about the possibility of any of their manufacturing facilities utilizing solar or renewable power.
18	Using 100% current solar income for product manufacture/assembly			x	x	0	0	
19	Using 100% current solar income for entire product				x	0	0	
4.0 Water								
20	Created or adopted water stewardship principles/guidelines		x	x	x	0	0	20. Cascade Designs does not have water stewardship principles in place. [source: Jim Giblin, Cascade Designs]
21	Characterized water flows associated with product manufacture			x	x	0	1	21. Jim Giblin at Cascade Designs detailed several procedures related to down and fabric; more information may be forthcoming from other areas of the company.
22	Implemented water conservation measures				x	0	1	22. It appears that multiple production processes are not completed in-house and therefore the company was not able to provide detailed information in this area.
23	Implemented innovative measures to improve quality of water discharges				x	0	0	23. The company does not have measures in place at this time to reduce water usage for the products our group is reviewing. [source: Jim Giblin, Cascade Designs]
5.0 Social Responsibility								
24	Publicly available corporate ethics and fair labor statement(s), adopted across entire company		x	x	x	0	0	24. Cascade highlights its support of various conservation groups on the website, but omits any statement of overall corporate responsibility or reports that would demonstrate their commitment to fair labor practices. Per Jim Giblin at Cascade Designs, the company's core values are around service and innovation.
25	Identified third party assessment system and begun to collect data for that system			x	x	0	0	25. A search of the company's website, including press releases for the last several years, reveals no such information. CEO letter has no mention of social responsibility.
26	Acceptable third party social responsibility assessment, accreditation, or certification				x	0	0	26. Currently, there is not any information online about any third-party certification related to social responsibility. Since it's a privately-held company, no annual shareholder reports are available to elaborate on such information. No information is available on public areas of the company's website.
Meets Certification Standard? (Optimistic Score)		no	no	no	no			
Meets Certification Standard? (Pessimistic Score)		no	no	no	no			

Appendix C //

Other material recommendations

Recommendation: YKK Zipper – Natulon

Contributing to Environmentally Friendly Clothing

Another component that has a large impact based on our LCA findings is the zipper in the Mira sleeping bag. We are recommending the company replace its standard zipper with the NATULON zipper by YKK. NATULON is a resource-saving zipper made using recycled PET bottles, polyester off-cuts and old fiber. NATULON is also made of homogeneous materials for the zipper chains (elements), sliders and tapes which makes them easy to recycle. By replacing this material, we will be working toward the design goal of reducing up to 50% of the material in the product. The current zipper is made up of three different types of non-recyclable material, so this will cover three different components with one replacement material.

[source: <http://www.ykk-usa.com/natulon.html>]

Recommendation: Terratek SC

We are recommending the company also consider replacing the cord toggle locks in the Mira sleeping bag and the air valve on the Neo Air with Terratek SC. The Terratek SC product is a unique biobased composite that can be formed into a variety of shapes and sizes. The Terratek SC line is made from up to 65% renewable material. The finished products have the functionality and characteristics equal to those of traditional plastics and can be injection molded or extruded using standard processing machinery.

[<http://www.greendotpure.com/index.php/resin/starch-composites>]



Recommendation: Partner with bluesign®

Our final recommendation for Cascade Designs is to consider partnering with a company like bluesign and / or ensuring that the materials within its supply chain are partnering with this system.

The bluesign® system unites the entire textile supply chain to jointly reduce its impact on people and the environment by focusing on the following priorities:

- Uniting the textile supply chain
- Eliminating substances posing risks to people and the environment from the beginning
- Responsible use of resources
- Safety for people and the environment

The company's goal is to link chemicals suppliers, textile manufacturers, and brands together to foster a healthy, responsible, and profitable textile industry.

[<http://www.bluesign.com/industry/bluesign-system#.UnqteSQmzbo>]

