Brainstorming questions to think about

* Kinds of disabilities that prevent hiking/ What are their physical limitations
* Kinds of community around them
* Kinds of people
* Kinds of terrain
* What’s currently out there for different markets
* Who are the stakeholders
* Which needs are universal to the project regardless of market, and what needs will be market-specific?
* Ways to reduce production cost
* What is the purchasing power of people with disabilities?
* Government subsidies for

Useful links from class

|  |  |
| --- | --- |
| <https://journals.sagepub.com/doi/full/10.1177/1687814017730541> | Discusses Limitations of the trailrider and other similar product, also proposes an improved solution |

* A certain difficulty by the guides to keep the chair in lateral equilibrium during a mountain trip, which entails a considerable energy dispersion and physical effort;
* A limit to the comfort of the disabled persons being transported that precludes the use of these kind of chairs by people with a certain level or type of pathology.
* In fact, the device is difficult to balance and this condition forces the guides to spend a lot of energy to maintain the right position instead of pushing
* some usershave noted that it is impossible to bring, with this type of device, people with a high degree of disability and/or particularly sensitive to high levels of stress or long periods of discomfort

|  |  |
| --- | --- |
| <http://www.joeletteandco.com/en/exclusive-manufacturer-of-the-joelette-all-terrain-chair/joelette-monoroue/> | An alternative to the Trailrider, looks a little further along in development |

* French product looks more refined than the current trail rider
* Operated by two people
* Compact and fits inside an SUV

|  |  |
| --- | --- |
| <http://shuswaptrailrider.com/wp-content/uploads/2013/03/TrailRider-Manual-20071.pdf> | Client provided user manual for current device |

Trail Rider specs:

<http://www.bcmos.org/trailrider.html>

* 23 kg
* 172 cm x 82 cm x 61 cm

StatsCan pages on disabilities:

<https://www150.statcan.gc.ca/n1/pub/89-654-x/89-654-x2018002-eng.htm>

From Table 4: Mobility disabilities in total population by age

* 1.6% 15-24 years old
* 7.3% 25-64 years old
* 24.1% 65-over years old

From Table 11: Median post-tax income stats in dollars

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disability status** | **Aged 25 to 64 years** | | **Aged 65 years and over** | |
| **Women** | **Men** | **Women** | **Men** |
| Persons without disabilities | 34,460 | 44,410 | 23,200 | 34,340 |
| **Persons with disabilities** |  | | | |
| Milder | 30,080 | 39,710 | 22,980 | 31,550 |
| More severe | 17,520 | 20,230 | 19,520 | 27,560 |

<https://www.rod-group.com/sites/default/files/2016%20Annual%20Report%20-%20The%20Global%20Economics%20of%20Disability.pdf>

Exhibit 1:

* 6.2 Canadians with disabilities
* 55.4B disposable income = average 9k/person
* 111.3B income = average $18 274/person

Trail classification in BC:

<https://squamishhiatus.com/hiking-terms/class-rating-system.html>

* Class 1: Well established, no steep section
* Class 2: Somewhat steep, may use hands
* Class 3: Need hands and footholds
* Class 4: Ropes recommended
* Class 5: technical climbing, ropes required

BC trail time vs. classification database:

<https://bcmc.ca/club_trip_grading.php>

* Seems like Class 1 trail are mostly 4 hours or less of hiking

**Interesting link:**

People with spinal cord injuries and their experience with hiking. Contains Trailrider section.

<https://www.researchgate.net/profile/Donna_Goodwin/publication/260037000_Hiking_excursions_for_persons_with_disabilities_Experiences_of_interdependence/links/0a85e52f29d4dd449a000000.pdf>

* Spinal cord injuries = paraplegic or quadriplegic disabilities. Paraplegic viewed trail-rider to lower physical independence, but good for social, psychological and behavioural interdependence.
* Comments on how physical activity & nature is beneficial to mental (social relationships, trust, communication) and physical health. It is no exception for disabled.
* Outside/Inside perspective in disabilities:
  + trail rider = “wheelbarrow” (outside)
  + Trailrider = interdependence (inside)
* Participants were taken from members of a hiking excursion program: 2 males, 2 females. Ages 27, 28, 36, 54. With time since the injury of 5, 4, 15 and 6 years.
  + 2 males, 2 females
  + Ages: 27, 28, 36, 54
  + Time since injury: 5, 4, 15, 6 years
  + 2 paraplegia, 2 quadriplegia
  + 2 with full-time jobs, 1 recently graduated, 1 unemployed
  + All participants were active in outdoor activities prior to the injury
* 2-hour hiking excursions in urban river valley park, administered by adult fitness and lifestyle university-based centre. Three phases:
  + Semi-groomed river valley trails (mountain bike path), unpaved, not regularly maintained
  + Groomed trails, frequent public use, little elevation change, wide enough for wheelchair and stroller
  + Photo sessions: participants got to see how they looked during the hikes, and the views
* Sherpa volunteers (university student and staff). Riders feel bad, but sherpas are part of hiking community who like doing sherpa work and are committed to sharing their love for the outdoors.

Biomechanics and Wheelchair Stress Analysis / Safety Factors

<https://ocw.mit.edu/courses/edgerton-center/ec-721-wheelchair-design-in-developing-countries-spring-2009/lecture-notes/MITEC_721S09_lec10_biomech.pdf>

* Rowing motion propulsion is much more efficient. Single Arm energy output = 73J/cycle (40 J on pull, 33 J on push stroke)
* Conventional hand-wheel propulsion, single arm energy output = 27 J
* Opposed hand-rim wheel rotation, single arm energy output = 35 J / stroke

Seat Cushion Design

<https://mobilitymgmt.com/articles/2011/05/01/form-function-cushions.aspx>

* the more closely the cushion shape matches the person’s body contour, the more surface area you have for distribution, and the more immersion you have
* Multi-media cushion - use gel fluid for the shape and skin protection and stiff foam base for positioning and lightening cushion.

Conventional wheelchair SPECS

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3944313/>

**Search and Rescue**

Links:

<https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/other/accessibility_proposed_code_change.pdf> (under A3.4.5.1)

* Standard stretcher size: 2010 mm long and 610 mm wide

<https://www.astm.org/Standards/search-and-rescue-operations-standards.html>

<https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/volunteers/sar_safety_program_operating_guidelines.pdf>

* Rescuers wear long sleeves long pants etc. (under: ground search)
* May use ropes & carabiner for mountain search *= basket stretcher good for this or seatbelts, need good connection for rope&carabiner? Helicopter rescue compatible?*

<https://patents.google.com/patent/US2512931A/en>

* Device can convert to field stretcher or basket stretcher

Other:

<https://www.frestems.fi/products/military-stretcher-equipment/promil-217-nato-field-stretcher/>

* Field stretchers weight range about 18 to 25lbs

**Discussion about scope:**

* Begin to develop direction for the scope. What do we want to focus on and why?
* This will come from the needs that we establish and their relative importance
* Review articles about client experience (like the “interesting link” above) are super helpful for this. It would also be cool to have interviews with clients or something. We’ll have to at least take questions from the BCMOS Q&A on Canvas.
* Rider comfort and Sherpa comfort seem to be big factors that could require considerable design work. Are there any riders who don’t use the device because it is too uncomfortable? How could we talk to these people?