SNOW Science:
The Role of TU Wien and TTL

Meinhard Breiling

Technische Universität Wien

Technology Tourism Landscape (TTL) Inter-faculty Cooperation Centre
E-mail: meinhard.breiling@tuwien.ac.at

TU Wien - TTL Roundtable - Nov. 10th, 2016, Vienna

Overview of presentation

Part 1: The Start of TTL at TU Wien 2004-2009

Part 2: Dendritic Snow Production 2009-2016

Part 3: The Future

Part 1: History of TTL at TU Wien

- 2004 A start with a Snow Conference
  - http://ttl.tuwien.ac.at/161110/reps/TTLProceedings.pdf
- 2006 Conference on Water [Framework Directive]
  - http://ttl.tuwien.ac.at/161110/reps/wfd06proceedings.pdf
- 2008 Polar Tourism Conference
  - http://ttl.tuwien.ac.at/161110/reps/proceedings_polar_tourism.pdf

Three Applications to FP7 Large Integrated Projects as Coordinator

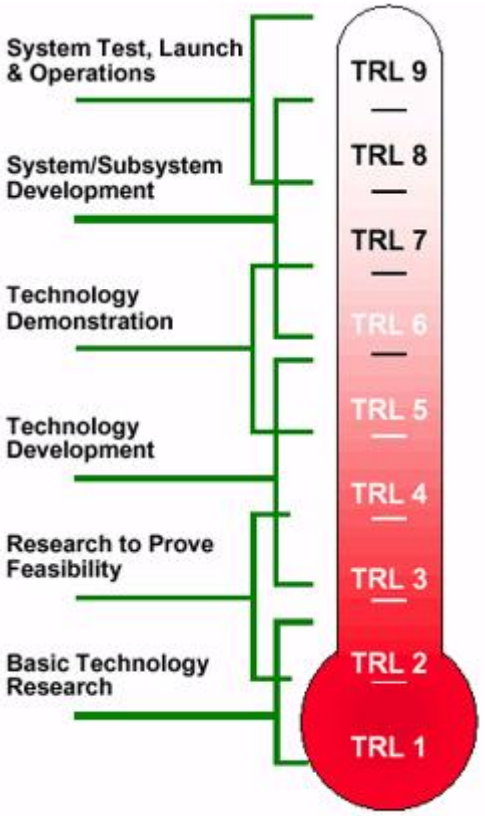
- 2007 SNOWFUTURE: FP7 Call in „Mountain Environments and Climate Change“
  - Not accepted
- 2008 SOGWAS: FP7 Call in „Groundwater Resources“
  - Eligable for funding, but score not high
- 2009 QUOWADIS: FP7 Call in „Aquatic Ecosystems“
  - Not accepted

As a Result: Firm Science Network

- More than 50 mainly European partners whom we know well through writing common applications
- Maybe 10 partners have a profile in snow science and applied snow science applications
  - The establishment of snow sciences in Europe
- Another 20 partners work in fields near and related to snow sciences
  - To here belongs my homebase at TU Wien „Urban Planning and Landscape Architecture“
- Remaining partners are complementary sciences and especially here we have the chance to find hidden treasures
  - This is the exciting because they never would consider themselves to have any relation to snow science
- Inside TU Wien
  - A treasure to be at the largest European technical university, many institutes are potential candidates for joint patent applications
  - TU Wien is one partner at international projects and we cover many aspects

Part 2: Dendritic Snow Production 2009 - 2016

- Patent application filed in 2009
- Austrian patent granted in 2015
- Austrian Staatspreis Patent 2016
- Technology is not yet on the market
- Several demonstration projects in ski areas
  - Kitzsteinhorn 2011-2014
  - Obergurgl 2014-2016
- Currently maturity grade 7 using NASA TRL



Who needs Snow Science?

- In Austria 3% of GDP depends directly on snow
  - Winter tourism is lead economy of non urban areas
- Artificial snow making in winter tourism
  - More than 300 large ski areas with a sophisticated snow management
  - 25,000 ha ski tracks, out of which 17,000 ha have infrastructure for snow making
  - Estimated one sixth of global capacity is currently in Austria
  - Ski domes become more attractive in urban areas if costs to produce snow come down
- Many more applications in science and business could be developed
  - Kitchen snow
  - Wellness and theraphy snow
  - Snow as a building material
  - Snow for cooling houses and rooms
  - Snow for isolating houses
  - Snow as an excitement
  - Snow in research applications
  - Snow has many more applications that have to be developed

Industry related to snow making for winter tourism

- Producers of snow making facilities
  - Until recently some 20 producers of snow making devices according to wet bulb technology
    - High pressure systems
    - Low pressure systems
  - Currently concentration process to three main players
    - Margins in selling snow making devices are becoming worse
    - Mergers to larger companies with a higher budget
  - Spin off „Neuschnee Ges.m.b.H.“
    - Based on award winning patent

Inventor Team on Nov. 11th, 2016

Part 3: The Future

- Supporting ski areas world wide to produce high quality snow
  - with less resources
    - Less water
    - Less energy
  - In more varied products
    - More uses
    - Fluffy snow for exclusive skiing
  - Better taylored to the needs of different ski resorts
    - Metereological conditions vary

Carpatian Mountains, RO

Foto: Predeal, 1. 2. 2016

Strbske Pleso, SK,

Foto: 5.11.2006

Shiga-ken, JP, plenty of snow……

Foto: 6.2.1999

……. But not economically viable

Foto: 14.10.1998

Winter Tourism is Technology Based Tourism

- During this century each year € 500 million have been invested into the infrastructure of 300 Austrian winter tourism resorts

- High Capacity Skilifts
- Artificial Snow Making
- Water Reservoirs
- Tubes to transport water

Another Future starts here in Vienna in 1927

Quelle: Österreichische Nationalbibliothek, Inventarnummer 113.397 a – D, Bildnachweis, ÖNB / Willinger, W

First ski dome world wide in Vienna, anno 1927

- Snow was made from soda

Quelle: Österreichische Nationalbibliothek, Inventarnummer 113.397 b – D, Bildnachweis, ÖNB / Willinger, W

Landscaping in Progress

Dubai Indoor Snow Amusement

New Markets for Skidomes: China and India

ALPS Center in Shenzhen

- Only place for skiing in southern China
- + 5°C temperature
- Poor snow conditions and high price

Thank you
and Welcome to
Round Table Snow Science