

Workshop on economic valuation of forest ecosystem services

Recreation function and Travel Cost Method

Stefan von Grünigen, economist, Partner

Agenda

- The Basics: TCM in a nutshell
- The Mechanics: Empirical Approaches
- The Bright Side and the Other Side
- Monetary Value of Swiss Forest Recreation
- Policy Implications and Recommendations

The Basics: TCM in a nutshell

- valuation method for ecosystem services, mainly used to estimate the recreational value of sites.
- TCM's origins can be tracked back to a correspondence between the famous economist Hotelling and the Director of the US National Park Service in 1947.
- First publications using TCM in the 60ies (Clawson et al.).
- Broadly used and much refined since then.



The Basics: TCM in a nutshell

- Main concept: Transport costs and the opportunity costs of the time spent travelling to a recreational site are used as a proxy for the price of that site.
- TCM estimates the recreational value of a natural site by relating demand (number of site visits) to its price (transport costs and opportunity costs of time used).

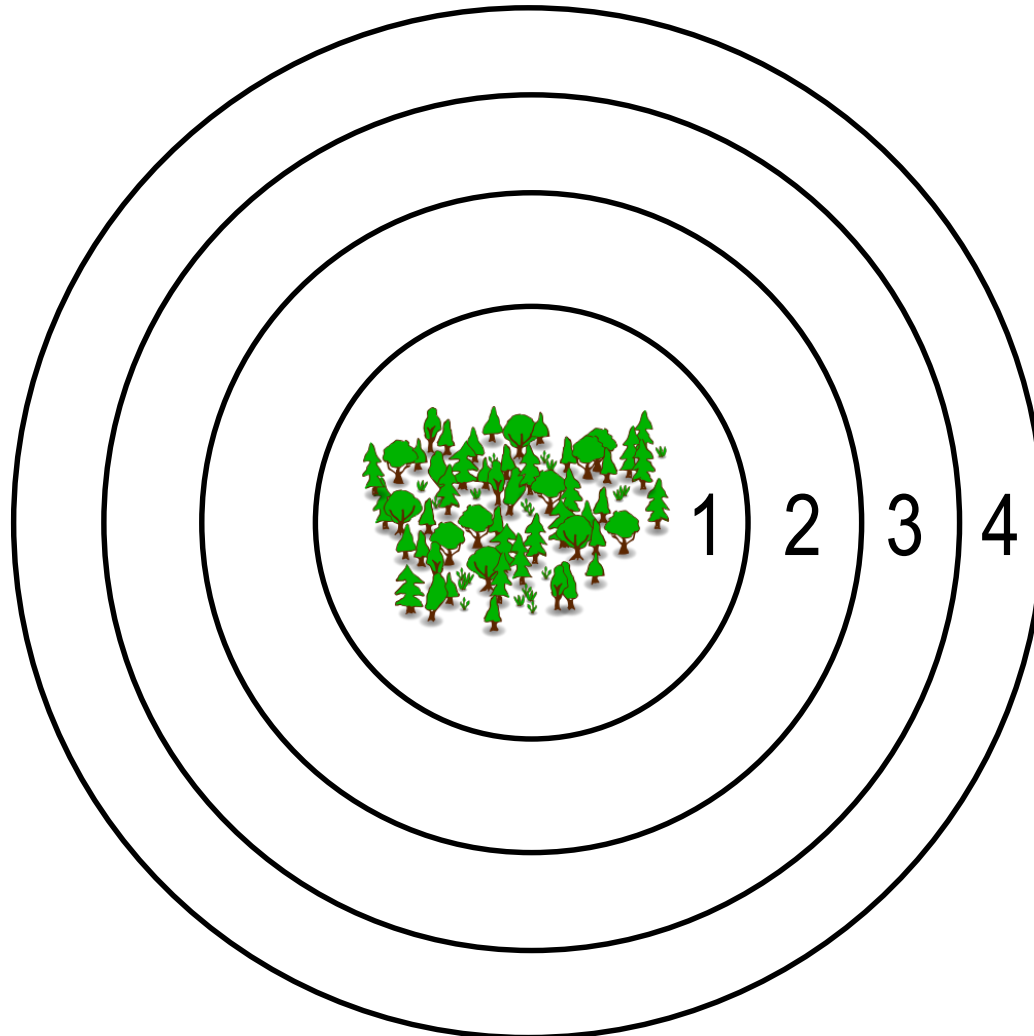
$$V = f(c, x)$$

- The demand function is used to calculate the consumer surplus and thus to estimate the economic benefit of the site.

The Basics: TCM in a nutshell

- TCM is based on
 - revealed preferences (*not* stated preferences)
 - benefit (*not* costs)
 - use value (*not* non-use values)
- TCM can be used to estimate the economic
 - benefits of the current use
 - losses by eliminating a site
 - benefits or costs of changing the quality of a site
- Empirical approaches
 - Zonal Travel Cost Method (zTCM)
 - Individual Travel Cost Method (iTCM)
 - Random Utility Travel Cost Method (ruTCM)

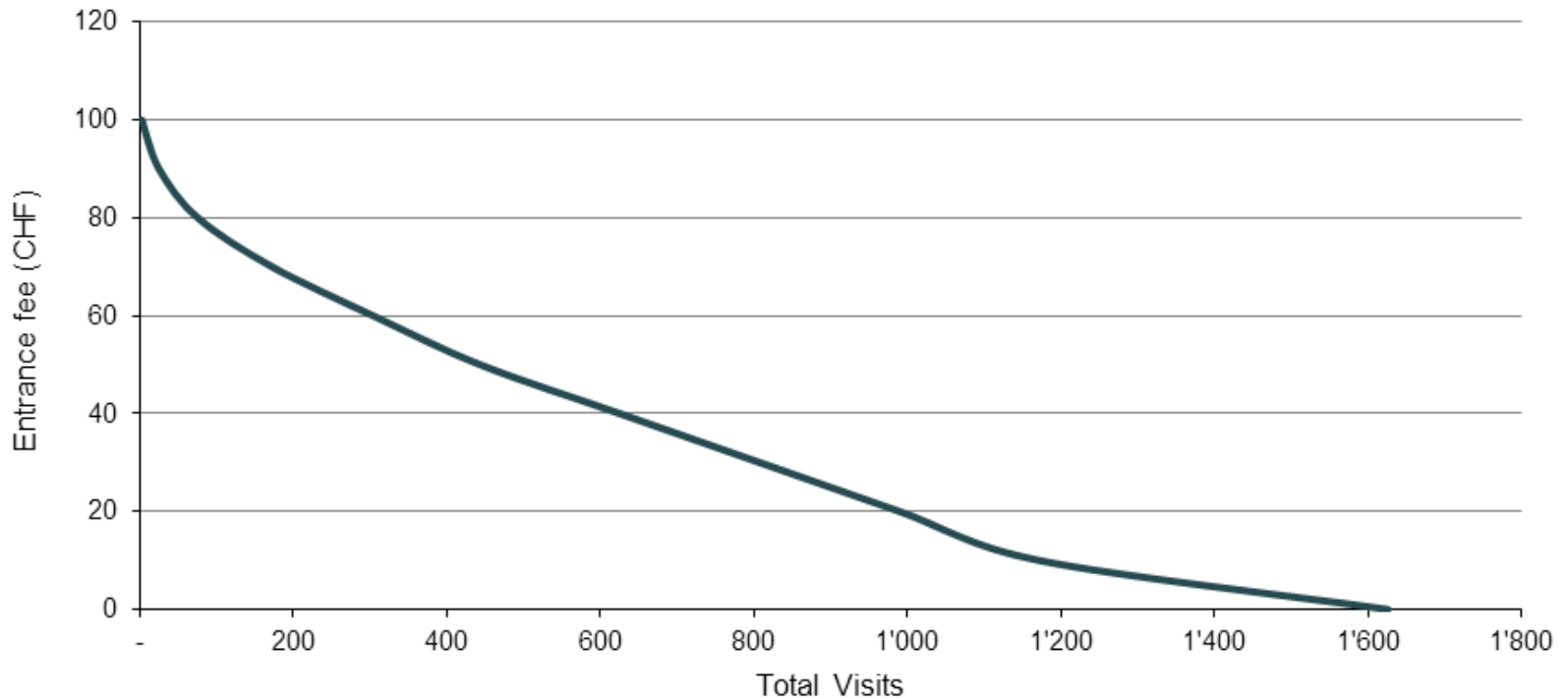
Zonal Travel Cost Method (zTCM)



zTCM – a classic recipe in 6 minutes

1. Define zones around the site.
2. Collect numbers of visitors from each zone.
3. Calculate visitor rates, round-trip travel distance, travel time and travel costs.
4. Estimate relation between visits and travel costs using more or less refined econometric models.
5. Construct the demand function for the average visitor by adding a hypothetical entrance fee and calculating the number of visits from each zone.
6. Calculate the consumer surplus.

zTCM – demand function and consumer surplus



iTCM: Same, same – but different!

- We use survey data of individuals rather than data about the number of visits from each zone.

$$V_{ij} = f(c_{ij}, x_i)$$

- Again, with econometric methods we estimate the relationship between the number of visits, travel costs and other pivotal variables.
- From the regression we can derive the demand function for the average visitor.
- By calculating the area below the demand function we get the average consumer surplus.

iTCM: Same, same – but different!

- The statistical model used can be more or less complex – we can add sociodemographic data about the visitor and other factors as needed.
- In most cases, however, we cannot identify the relation between site quality and the number of visits (the quality is the same for all visitors).
- Simple TCM models do not account for relevant substitute sites and can only estimate demand for sites that are visited.
- Moreover, it's not possible to estimate the demand effect of individual site characteristics.

Random Utility Travel Cost Method (ruTCM)

- To deal with these problems, discrete-choice models are used to characterize demand.
- The ruTCM is very different from the other two approaches. It estimates the probability of choosing a certain site over all other sites depending on
 - the characteristics of that site and all other sites,
 - the travel costs to each site.
- Data is needed not only from one site but also concerning all other sites.
- Econometric models are more complex.

Transport and time costs

- Transport costs
 - Car travel: CHF/km
 - Public transport: ticket price

- Time costs
 - values used for congestion costs calculations (standards)
 - wage rate (1/3 to 1/2 of normal wage rate)
 - ➔ There is no consensus about the right way of valuating the opportunity costs of time spent traveling to a recreational site.

On the bright side...

- TCM is based on revealed preferences (actual behavior) rather than stated preferences.
- TCM is not controversial because it uses standard economic theory and methods.
- Often secondary data can be used and even if primary data has to be collected it is not too expensive (especially with the zonal approach).
- The results are quite easy to explain and can be understood without too much background.

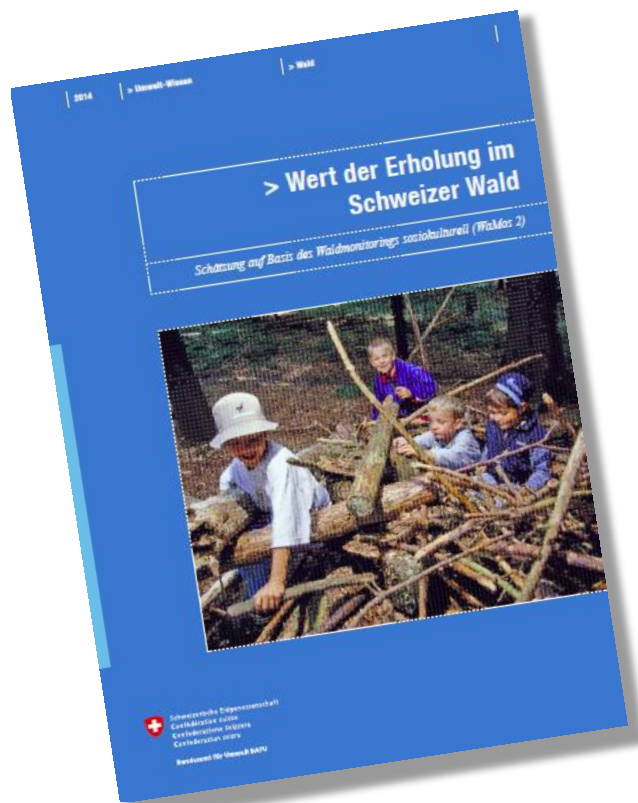
However, there are some points to care about...

- Methods to estimate opportunity costs of travel-time can be controversial:
 - There's no consensus about the right wage rate
 - Time spent could be a benefit and not a cost
- Type and purpose of travel
 - People on multi-destination trips or on holiday in a region with multiple sites: Danger of underestimating the value.
 - Additional purpose of travel: Danger of overestimating the value.
- There's a need for variability in travel distances – TCM is less useful for sites near population centers.

Some more points...

- The presence of other recreational sites can be a problem – this can be taken into account using more complex empirical approaches like ruTCM.
- Some people choose to live near a specific site because they value that site very much – this value is often not fully captured.
- Non-use values are not taken into account at all. The value of sites with outstanding qualities that are highly valued by non-users will be underestimated.

Monetary Value of Swiss Forest Recreation



- Study commissioned by the Swiss Federal Office for the Environment (FOEN) and carried out by econcept.
- Based on data of the second Swiss Forest Monitoring (WaMos 2) of 2012.
- Due to a lack of data about the site visited, a simplified version of the TCM had to be used.

→ <http://www.bafu.admin.ch/publikationen/publikation/01775>

→ Swiss Forestry Journal 165 (2014) 5: 113-120

Monetary Value of Swiss Forest Recreation

- The minimal recreational value was estimated at 290 to 589 CHF per person and year.
- For Switzerland's population of the over 18-years old the value sums up to between 1.9 and 3.9 billion CHF per year.
- The study was carried out in the same way as a similar study in 2004, however, using new data.

Differences between survey 1999 and 2012

	econcept 2005 based on WaMos 1999	econcept 2014 based on WaMos 2012	Difference in %
Travel duration (average, one way, minutes)	19.3	12.9	-33%
Time costs (average, CHF/h)	10.0	12.2	22%
Time costs (average, one way, CHF)	3.2	3.0	-7%
Transportation costs (average, one way, CHF)	2.9	1.5	-47%
Average Travel Costs per visit (CHF)	12.1	9.0	-26%
visits (average, per year)	59	64	8%
Average Travel Costs per Person and year (CHF)	544	418	-23%
Population over 18	5'892'822	6'577'492	12%
Value for Switzerland (million CHF)	3'206	2'751	-14%

Determinants of recreational value

- Can the value of forest recreation be explained
 - by the visitor's socio-economic and personal characteristics,
 - by the activities performed in the forest or
 - by the motives leading to the visit?

- ➔ The value of forest recreation is mostly driven by:
 - the distance between visitor's domicile and the forest,
 - the possibilities for substitution,
 - the visitor's socio-economic and personal characteristics and
 - the amount of infrastructure in the forest.

- ➔ Other properties of the forest itself have no influence.

Policy Implications and Recommendations

- TCM is a useful and effective method to evaluate the use-value of recreational sites.
- The classic empirical approaches are rather simple. Approaches like ruTCM, however, are state-of-the-art and can handle a lot of the issues of simple TCM.
- TCM can be used to estimate the value of forest ecosystem services, especially of single sites.
- TCM has its limitations!
- Valuating the opportunity costs of time remains controversial.

Policy Implications and Recommendations

- A big advantage of TCM is the possibility to use secondary data. However, we should think about economic valuation before data is collected!

Finally!

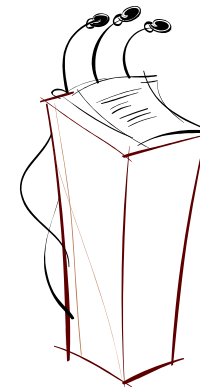
- Communication is easier with economic values.
- The magnitude is more important than the exact values.
- Making the welfare contribution of forest ecosystems systematically visible
 - rises political and general awareness,
 - improves performance measurement and management,
 - gives environmental aspects the necessary priority in political decisions.

Working for a small change...

We cannot afford **protection of forest ecosystems:**
Our people want food, health and wealth!



We cannot afford **loss of forest ecosystems:**
Our people want food, health and wealth!



Schweiz.
ganz natürlich.



Thank you very much

contact: stefan.vongruenigen@econcept.ch