

Understanding User Perspectives on Sustainability and Fairness in Tourism Recommender Systems



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Agenda

Tourism Recommender Systems (TRS) Overview

Motivation & Background

Societal Fairness

Methodology

Results

Conclusion & Future Work

Q&A and Discussion



Tourism Recommender Systems (TRS)

Booking.com yelp 



- simplify trip planning for travelers by offering personalized recommendations
- useful to minimize information overload
- particularly challenging domain owing to the influence of dynamic factors like seasonality and travel regulations, as well as capacity-limited items such as airline seats, hotel rooms, and event tickets
- Multistakeholder environment encompassing multiple stakeholders

Tourism Recommender Systems: Stakeholders*

Fairness Type	Examples	Fairness Concern
C-Fairness (Consumers)	Tourists using the recommender system	Individual & Group Discriminations
I-Fairness (Item Providers)	City authorities & tourist sites	Popularity, Exposure Bias
P-Fairness (Platforms)	Platform operator hosting the recommender system	Ranking Bias
S-Fairness (Society)	Local communities & the environment	Sustainability

Multistakeholder Recommender Systems

Ideal Scenario

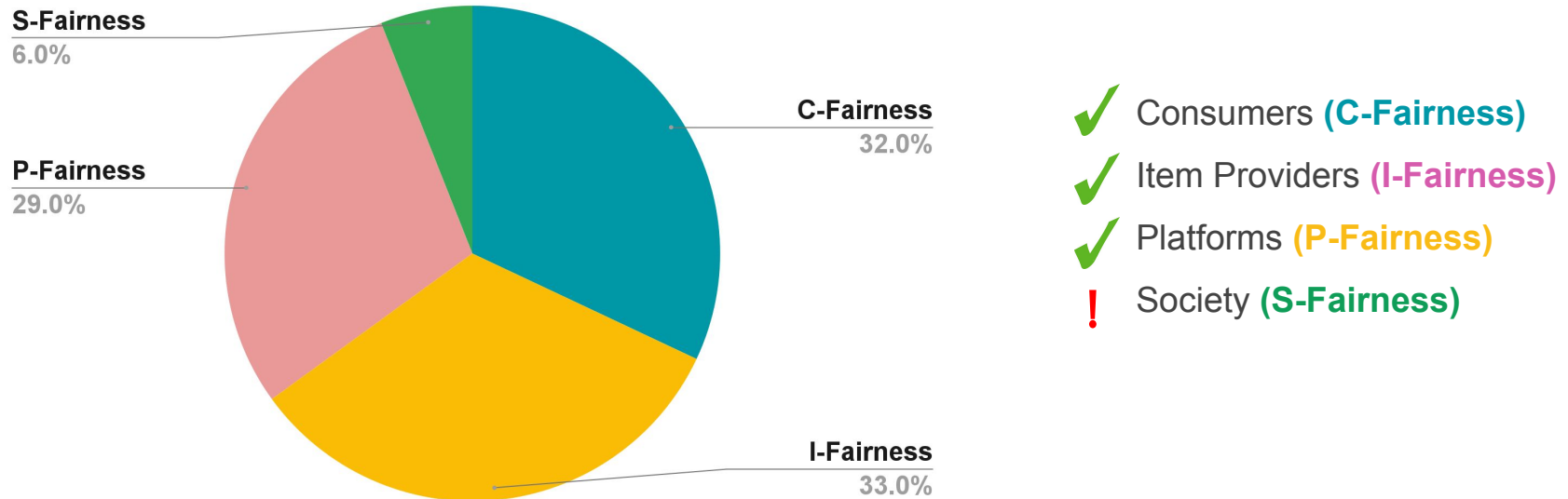
→ Consider the **needs** of **all stakeholders** i.e. is **fair** to all of them

- ✓ Consumers (**C-Fairness**)
- ✓ Item Providers (**I-Fairness**)
- ✓ Platforms (**P-Fairness**)
- ✓ Society (**S-Fairness**)

Multistakeholder Recommender Systems

👁️ Reality (Research Gaps)*

Total papers in TRS: 66; Stakeholder-focused papers in TRS: % breakdown



*A Review on Individual and Multistakeholder Fairness in Tourism Recommender Systems, [Ashmi Banerjee](#), Paromita Banik, Wolfgang Wörndl, *Frontiers in Big Data*, Volume 6, pages 41
doi: [10.3389/fdata.2023.1168692](https://doi.org/10.3389/fdata.2023.1168692)

Societal Fairness (S-Fairness)

Definition

We define **Societal Fairness**, or **S-Fairness**, in the context of TRS as considering the *impact of tourism on non-participating stakeholders (society)*, such as residents who may be *affected* by issues such as *increased housing prices, environmental pollution, and traffic congestion*.

Here, we use the terms sustainability and S-Fairness interchangeably.

Our Goals

1

Gather insights on effective approaches to promote S-Fairness

2

Analyze how sustainability affects user acceptance of recommendations.

3

Determine the most helpful factors aiding users' decisions.

Survey Details

- Created using Qualtrics
- Distributed online through various social media channels
- Total 103 responses
- No PII or demographic data collected
- Participants asked questions on:
 - choosing one item from the provided lists,
 - the reasoning behind &
 - their satisfaction with the list.

Sustainable vs. Unsustainable

Sustainable

Unsustainable



<4 Stars

>4 stars



<100 reviews

>100 reviews



Less crowded

Overcrowded



Low CO2 emissions

High CO2 emissions



Accessible by public transport

Only accessible by car

Recommendation Lists

🍀 Emphasizing Sustainable Options (L1)



Main City Square



2,133 reviews



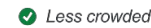
There are several Museums, National Library, Basilica, the Bell Tower and some other attractive tourist spots. It remains mostly crowded that impacts the quality of life of the residents.



Walk by Fondamenta Canal



17 reviews



A hidden canal that takes you on a quiet route with eateries filled with local people, thus an experience of the local culture with minimal carbon footprint.



Water Taxi Ride



1,675 reviews



The water taxis (Vaporetto) are the main form of transport to experience the largest monumental canal of Venice from water. Vast amount of carbon emissions from its fuel contribute to air and water pollution.

- Includes at least **1 sustainable** option
- Intention of directing users towards the more sustainable choice

Recommendation Lists

Higher Proportion of Sustainable Options (L2)



Vittorio Veneto Hike

A nice walk in the hills with vast nature and historical significance. This hiking trail is reachable by local public transport thus you can utilize and support it by paying for tickets, as well as reduce your carbon footprint.



27 reviews



Grand Canal View from Rialto Bridge

Ponte di Rialto is the most iconic bridge that spans the impressive Grand Canal. It is often over-touristed causing the infrastructure to overload.



1,001 reviews

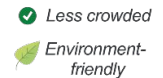


Grand Canal View from Calle San Bernardo

If you walk down the street of Calle San Bernardo, you will find yourself directly on the Canal Grande. Here you can admire a different and unique view of the most famous canal in Venice.



1 review



- Includes **higher proportion of sustainable** options
- To assess user preference for sustainable options when choosing between sustainable and unsustainable ones.

Recommendation Lists

Sustainable Alternatives for each Unsustainable Option (L3)



Main City Square ★★★★★
 2,133 reviews
 ⚠️ Overcrowded
 There are several Museums, National Library, Basilica, the Bell Tower and some other attractive tourist spots. It remains mostly crowded that impacts the quality of life of the residents.



Water Taxi Ride ★★★★★
 1,675 reviews
 ⚠️ High CO2 emissions
 The water taxis (Vaporetto) are the main form of transport to experience the largest monumental canal of Venice from water, with vast amount of carbon emissions from its fuel contributing to air and water pollution.



Grand Canal View from Rialto Bridge ★★★★★
 1,001 reviews
 ⚠️ Overcrowded
 Ponte di Rialto is the most iconic bridge that spans the impressive Grand Canal. It is often over-touristed causing the infrastructure to overload.



Mount Cinto Hike ★★★★★
 1,895 reviews
 ⚠️ Only accessible by car
 One of the best natural areas to Venice with beautiful views and lush greenery. This hiking trail is only reachable by car, e.g. taxi or Uber from the city.

Check out this alternative



Hidden City Squares ★★★☆☆
 22 reviews
 ✓ Less crowded
 ✓ Environment-friendly
 As the name says it all, these are many other beautiful and less busy squares sprinkled around Venice to escape the human deluge in the rest of town.

Check out this alternative



Walk by Fondamenta Canal ★★★☆☆
 17 reviews
 ✓ Less crowded
 ✓ Environment-friendly
 A hidden canal that takes you on a quiet route with eateries filled with local people, thus experience the local culture with minimal carbon footprint.

Check out this alternative



Grand Canal View from Calle San Bernardo ★★★★★
 1 review
 ✓ Less crowded
 ✓ Environment-friendly
 If you walk down the street of Calle San Bernardo, you will find yourself directly on the Canal Grande. Here you can admire a different and unique view of the most famous canal in Venice.

Check out this alternative



Vittorio Veneto Hike ★★★☆☆
 36 reviews
 ✓ Accessible by public transport
 ✓ Environment-friendly
 A nice walk in the hills with vast nature and historical significance. This hiking trail is reachable by local public transport thus you can utilize and support it by paying for tickets, as well as reduce your carbon footprint.

Results: Overview

1

Gather insights on effective approaches to promote S-Fairness

Equal number of sustainable & unsustainable options

→ High selection rate of sustainable items + Highest user satisfaction

Results: Overview

2

Analyze how sustainability affects user acceptance of recommendations.

Explanations on sustainability + caution signs
→ Effective strategies for guiding users toward sustainable choices

Results: Overview

3

Determine the most helpful factors aiding users' decisions.

Environment-friendliness + less crowdedness
→ Stronger impact on users' sustainable choices than public transport accessibility

Limitations

- Our study is very preliminary
- Based on synthetic, non-personalized recommendations
- Our current definition of “Sustainability” may be debatable & incomplete
- Low ratings alone may not serve as the exclusive determinant of sustainability

Potential Solutions

- Using real-world datasets & trying out the approach more empirically
- Using personalized recommendations
- User survey with better control groups

Thank You! Time for Q&A!



References  <https://bit.ly/fair-umap-2023>