A spatial framework for identifying and evaluating pedestrian shortcuts in semi-rural areas: Case study from Skaun, Norway

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Introduction

Norwegian cities and towns aim to reduce car dependency to achieve their ambitious goals for sustainable transportation. A key strategy in this effort is promoting active travel modes, especially walking. However, semi-rural municipalities often face structural and spatial challenges that make walking less attractive.

As travel time is a major factor in transport mode choice, even minor improvements in accessibility can encourage walking over driving. One promising but underexplored strategy is the integration of pedestrian shortcuts into the network. These informal connections often already exist but are unmapped, unmaintained, and rarely incorporated into a comprehensive network.

Municipalities lack systematic tools to identify, evaluate, and prioritize such connections in a coordinated and resource-efficient way. This study wants to overcome these challenges by developing a method to support data-informed planning of pedestrian infrastructure, using Skaun Municipality as a case study. The study addresses the following research questions:

1. How can pedestrian shortcuts be systematically identified within existing networks?
2. How can their network effects on accessibility be evaluated?
3. How can such shortcuts be prioritized for implementation?

By combining geospatial data, GPS-tracked walking behavior, spatial analysis methods (Walk Score and Space Syntax) and land-use constraints, we propose a replicable framework that aligns with limited municipal planning capacity while supporting national goals for active mobility.

Method

We developed a spatial framework to identify, evaluate, and prioritize pedestrian shortcuts in semi-rural areas. The process consists of three key steps:

First, we mapped potential shortcut corridors by identifying connections between settlement clusters and key destinations, such as schools and recreational areas. These corridors were cross-checked with GPS data to detect existing informal paths and potential desired routes. Feasibility was assessed based on land-use plans, with a focus on municipally owned land.

Second, we evaluated the impact of the proposed shortcuts on accessibility using two complementary methods:

- An adapted Walk Score for rural settings, measuring proximity to daily destinations and recreational areas.
- Space Syntax analysis, using normalized angular integration (NAIN) and choice (NACH), to quantify the spatial integration of each segment and estimate potential pedestrian movement.
  This step allowed us to assess both local and global accessibility gains from the proposed network improvements.

Third, we intersected walkability improvements with population grid data to estimate the number of residents benefiting from each shortcut. A simplified cost–benefit screening was conducted to rank shortcuts based on implementation feasibility and potential network effects. These results in a prioritized list of high-impact connections.

Results

Our analysis identified 110 potential shortcuts across three settlements, based on spatial need, GPS-tracked walking behavior, and feasibility (e.g. municipal land ownership).

To evaluate the accessibility impact, we used both an adapted Walk Score and Space Syntax metrics. The Walk Score reflected substantial improvements in amenity-rich areas: over 1,000 residents (about 8% of the population) shifted from very car-dependent zones to somewhat walkable or better. In more rural settings with fewer destinations, Walk Score changes were minor. To complement this, Space Syntax revealed increased global and local integration, especially around schools and shortcut corridors, indicating higher potential for pedestrian flow and spatial accessibility, even in areas with low destination density.

A cost–benefit screening identified 45 shortcuts as high-priority due to strong network effects and low implementation costs. Overall, the results support targeted investment in pedestrian infrastructure in dispersed, semi-rural settings, combining behavioral, spatial, and planning perspectives.

Implications

Shortcut analysis offers a practical decision-making tool for promoting active mobility. By combining observed walking behavior, land ownership data, and spatial accessibility metrics, the method identifies feasible pedestrian network improvements grounded in local conditions.

The use of Walk Score and Space Syntax supports both technical evaluation and communication with stakeholders. This is an important factor in Norway, where municipalities often face limited planning capacity and rely on cross-sector collaboration. Integrating population data and area plans into the prioritization process enables more informed and equitable investments in pedestrian infrastructure.

The framework is flexible and transferable, making it well-suited for other rural municipalities in Norway that seek to strengthen walkability.

Proposals for subject placement: Mobility and Behavior