What if people could access many basic needs on foot or in a single transit trip?
LIVABLE TRANSIT CORRIDORS: Methods, Metrics, and Strategies
Central questions for livability, transit corridors, & planning

- What is **livability**?
- Can livability be measured using metrics?

- What is a **transit corridor**?
- How can corridor livability be assessed?

- What **planning method** can promote Livable Transit Corridors (LTC)?
- In what ways can the planning method be applied?
LIVABILITY
The critics say…

- too “squishy”
- “everything but the kitchen sink”
- Many opinions
- can’t be measured.

Our approach…

- Uses clear definition
- flexible, but bounded definition
- flexible & inclusive process
- metrics for measurement.
Partnership’s Livability Principles

**PARTNERSHIP PRINCIPLES**

- Provide more transportation choices
- Promote equitable and affordable housing
- Enhance economic competitiveness
- Support existing communities
- Coordinate and leverage federal policies and investments
- Value communities and neighborhoods

**OPERATIONALIZED LIVABILITY PRINCIPLES**

- Transit, walking, and bicycling opportunities
- Affordable housing near transit
- Accessible economic opportunities
- Community, cultural, and recreational opportunities
- Governmental and social services
- Healthy, safe, and walkable neighborhoods
Livability Definitions: Unclear Outcomes

Source: CFA Consultants

Livability

- Choice/access
- Community
- Affordability
- Quality of life
- Etc

Mystery Outcome

Source: CFA Consultants
Definition focusing on Quality of Life

- 
- 
- 
- 

“Livable communities are places where people have good access to opportunities they can use in the pursuit of improvements to their quality of life (QOL).”

Source: CFA Consultants
Livability: Internal Trip Capture (IC) as QOL Indicator

\[ \text{IC} = \frac{(I - I)}{(I - I) + (I - X) + (X - I)} \]

- \( I - I = \text{Internal to Internal trips} \)
- \( I - X = \text{Internal to External trips} \)
- \( X - I = \text{External to Internal trips} \)

Source: CFA Consultants
Transit Corridors: Critics & Our Approach

The critics say…
- difficult to define
- too much variety
- too many stakeholders
- nobody’s in charge

Our approach…
- flexible definition
- provides typology to classify & understand
- embraces diversity
- provides collaborative process
Defining a Transit Corridor: Many Methods, Little Agreement

Collection of Stations versus Complete Corridor

- Collection of station areas:
  - Misses outside of station areas
  - Does not distinguish between long & short station spacing

- "Complete" corridor area:
  - Captures inside & outside station areas
  - Distinguishes between long & short station spacing
Local Access:
Livability Only Partly Addressed

Diversity
Complementary Uses

Design
Walkable Connections

Density
Frequent Transit Service & Local Destinations

LOCAL ACCESS
(Livability Only Partly Addressed)

Healthy, Safe & Walkable Neighborhoods
Transit, Walking & Biking Opportunities
Accessible Economic Opportunities
Community, Culture & Recreational Opportunities

Source: CFA Consultants, Taecker Planning & Design and San Diego State University
Corridor Access:
Livability Can Be Fully Addressed

CORRIDOR ACCESS
(Livability Can Be Fully Addressed)

- Transit, Walking, & Bicycling Opportunities
- Affordable Housing Near Transit
- Accessible Economic Opportunities
- Community, Cultural, & Recreational Opportunities
- Governmental & Social Services
- Healthy, Safe, & Walkable Neighborhoods

Source: CFA Consultants, Taecker Planning & Design and San Diego State University
A Complete Corridor Illustrated

Source: Taecker Planning & Design
Case Study Corridors: 350+ from Across the United States

Over 350 Transit Corridors Studied

Source: CFA Consultants and San Diego State University
CORRIDOR TYPOLOGY
Measurement: Developing the Typology

- “People” & “Place”
- More diversity → more QOL
- People & Place interact → more QOL

Source: CFA Consultants based in part on Center for Transit Oriented Development
<table>
<thead>
<tr>
<th>PRINCIPLES</th>
<th>FACTORS</th>
<th>CORRIDOR TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transit, walking &amp; bicycling opportunities</strong></td>
<td>Place: Urban Form</td>
<td><strong>EMERGING</strong></td>
</tr>
<tr>
<td></td>
<td>People: Transit &amp; Non-Auto Services</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Affordable housing near transit</strong></td>
<td>Place: Mixed-Income Housing</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>People: Economically &amp; Age-Diverse Population</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Accessible economic opportunities</strong></td>
<td>Place: Employment Opportunities</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>People: Consumer Opportunities</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Government &amp; social services</strong></td>
<td>Place: Accessible Services</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>People: Effective Services</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Community, cultural &amp; recreational opportunities</strong></td>
<td>Place: Urban Form</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>People: Cultural &amp; Recreational Opportunities</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Healthy, safe &amp; walkable neighborhoods</strong></td>
<td>Place: Pedestrian-Friendly</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>People: Safety</td>
<td>Low</td>
</tr>
</tbody>
</table>

Source: CFA Consultants based in part on Center for Transit Oriented Development
## CHARACTERISTICS OF CORRIDOR TYPES

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Emerging</th>
<th>Transitioning</th>
<th>Integrated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infrequent Transit</strong></td>
<td>Infrequent Transit</td>
<td>Moderate Transit Frequency</td>
<td>High Transit Frequency</td>
</tr>
<tr>
<td><strong>Limited Street Connectivity</strong></td>
<td>Limited Street Connectivity</td>
<td>Moderate Street Connectivity</td>
<td>High Street Connectivity</td>
</tr>
<tr>
<td><strong>Low Intensity &amp; Little Mixed Use</strong></td>
<td>Low Intensity &amp; Little Mixed Use</td>
<td>Moderate-to-High Intensity</td>
<td>Moderate-to-High Intensity</td>
</tr>
<tr>
<td><strong>Major Destination</strong></td>
<td>Moderate Street Connectivity</td>
<td>Some Mix of Uses</td>
<td>Mix of Complementary Uses</td>
</tr>
<tr>
<td><strong>Suburban Commuter</strong></td>
<td>COMMERCIAL/INDUSTRIAL</td>
<td>MAJOR DESTINATION</td>
<td>TRANSIT-ORIENTED NODES</td>
</tr>
<tr>
<td><strong>Commute Hours</strong></td>
<td>- Commute Hours</td>
<td>- Activity Centers</td>
<td>- Multiple Activity Centers</td>
</tr>
<tr>
<td><strong>Employment Focus</strong></td>
<td>- Employment Focus</td>
<td>- Jobs and Housing</td>
<td>- Job-Housing Balance</td>
</tr>
<tr>
<td><strong>Few Retail Destinations</strong></td>
<td>- Few Retail Destinations</td>
<td>- Basic Connectivity</td>
<td>- Enhanced Connectivity</td>
</tr>
<tr>
<td><strong>Little Employment</strong></td>
<td>- Little Employment</td>
<td><strong>REVITALIZING / REDEVELOPING</strong></td>
<td><strong>Continuous Transit-Oriented</strong></td>
</tr>
<tr>
<td><strong>Suburban Local</strong></td>
<td>- Infrequent Service</td>
<td>- Legacy of Connectivity</td>
<td>- High Intensity</td>
</tr>
<tr>
<td><strong>Circuitous Routes</strong></td>
<td>- Circuitous Routes</td>
<td>and Mix of Uses</td>
<td>- Integrated Uses</td>
</tr>
<tr>
<td><strong>Residential Focus with Strip Commercial</strong></td>
<td>- Residential Focus with Strip Commercial</td>
<td></td>
<td>- Enhanced Connectivity</td>
</tr>
</tbody>
</table>

Source: CFA Consultants
METRICS for Corridors and Livability
<table>
<thead>
<tr>
<th>Transit Corridor Livability Principles</th>
<th>Factor Category</th>
<th>Factor Name</th>
<th>Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit, walking, and bicycling</td>
<td>Place</td>
<td>Urban form</td>
<td>Transit employment accessibility (weighted employment within 45-minute</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>transit commute</td>
</tr>
<tr>
<td></td>
<td>People</td>
<td>Transit and non-auto service quality</td>
<td>Corridor transit service coverage (aggregate frequency of transit service</td>
</tr>
<tr>
<td>Affordable housing near transit</td>
<td>Place</td>
<td>Mixed-income housing</td>
<td>Corridor housing unaffordability (percent of income spent for housing)</td>
</tr>
<tr>
<td></td>
<td>People</td>
<td>Economically and age-diverse</td>
<td>Income diversity (average variance of census block group household</td>
</tr>
<tr>
<td></td>
<td></td>
<td>population</td>
<td>incomes in corridor from corridor-wide average household income)</td>
</tr>
<tr>
<td>Transit-accessible economic</td>
<td>Place</td>
<td>Employment opportunities</td>
<td>Corridor jobs density (employees/acre)</td>
</tr>
<tr>
<td>opportunities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>People</td>
<td>Consumer opportunities</td>
<td>Corridor retail jobs density (corridor retail employees/acre)</td>
</tr>
<tr>
<td>Accessible social and government</td>
<td>Place</td>
<td>Effective services</td>
<td>Corridor transit ridership balance (ratio of the sum of each corridor's</td>
</tr>
<tr>
<td>services</td>
<td></td>
<td></td>
<td>boardings and alightings)</td>
</tr>
<tr>
<td></td>
<td>People</td>
<td>Accessible services</td>
<td>Corridor health care opportunities (health care employees/acre)</td>
</tr>
<tr>
<td>Vibrant and accessible community,</td>
<td>Place</td>
<td>Urban form</td>
<td>Corridor density (population/acre)</td>
</tr>
<tr>
<td>cultural, and recreational</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>opportunities</td>
<td>People</td>
<td>Cultural &amp; recreational opportunities</td>
<td>Access to culture &amp; arts (corridor entertainment employees/acre)</td>
</tr>
<tr>
<td>Healthy, safe, and walkable</td>
<td>Place</td>
<td>Pedestrian-oriented environment</td>
<td>Corridor pedestrian environment (intersection density)</td>
</tr>
<tr>
<td>transit corridor neighborhoods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>People</td>
<td>Neighborhood safety</td>
<td>Corridor pedestrian collisions per daily 100,000 pedestrians</td>
</tr>
</tbody>
</table>

Source: CFA Consultants
# Example Metrics

<table>
<thead>
<tr>
<th>Transit Corridor Livability Principles</th>
<th>Factor Category</th>
<th>Factor Name</th>
<th>Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordable housing near transit</td>
<td>Place</td>
<td>Mixed-income housing</td>
<td>Housing affordability</td>
</tr>
<tr>
<td></td>
<td>People</td>
<td>Economically and age-diverse population</td>
<td>Income diversity</td>
</tr>
</tbody>
</table>

Source: CFA Consultants
Livability Calculator: Putting the Handbook into Action

- Instant metric scores for user-defined corridor in U.S.
  - Has data for all U.S. for 10 of 12 metrics
  - User enters Census Block Group IDs for corridor
- Identifies corridor strengths and needs
- Helps classify corridor’s in typology
- Recommends implementation goals and strategies
Livability Calculator: Generating your Corridor’s Metric Scores

**EXAMPLE OF CALCULATOR SCORES**

Observed corridor “z-score” compared with mean for each corridor type.

<table>
<thead>
<tr>
<th>AFFORDABLE HOUSING NEAR TRANSIT</th>
<th>HEALTHY, SAFE &amp; WALKABLE NEIGHBORHOODS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLACE</strong> Housing Affordability</td>
<td><strong>PLACE</strong> Pedestrian Environment</td>
</tr>
<tr>
<td><strong>PEOPLE</strong> Income Diversity</td>
<td><strong>PEOPLE</strong> Pedestrian Collisions</td>
</tr>
</tbody>
</table>

| 2.50 | 0.20 | 0.40 |
| 2.00 | 0.15 | 0.35 |
| 1.50 | 0.00 | 0.36 |
| 1.00 | 0.01 | 0.04 |
| 0.50 | -0.17| -0.05 |
| 0.00 | -0.48| -0.19 |
| -0.50| -0.11| -0.60 |
| -1.00| -0.50| -0.60 |

- **OBSERVED CORRIDOR**
- **INTEGRATED MEAN**
- **TRANSITIONING MEAN**
- **EMERGING MEAN**

Source: CFA Consultants
Livability Calculator: Screenshot

Source: CFA Consultants
Livability Calculator: Classifying Your Corridor

- Black dots = observed corridor
- Red area = Emerging
- Yellow area = Transitioning
- Green area = Integrated

Source: CFA Consultants
STEP 3: LIVABILITY PERFORMANCE GRAPH

This chart plots the performance of your study corridor (based on the census block groups you inserted into the Inputs worksheet) in relation to the three corridor types (Emerging Corridor, Transitioning Corridor, and Integrated Corridor). Each axis of the chart represents one of the six Livability Principles. The red area of the chart delineates the thresholds for Emerging Corridors, the yellow area delineates the thresholds for Transitioning Corridors, and the green area delineates the thresholds for Integrated Corridors. The black line in the chart denotes your study area, and the shape of this line indicates the performance. Cases where the black line is near the outer edge of the chart indicate strong performance for that principle, whereas cases where the black line is near the center of the chart indicate poor performance for that principle.

Livability Performance

High-quality transit, walking, and bicycling opportunities
Mixed income housing near transit
Transit-accessible economic opportunities
Accessible social & government services
Vibrant & accessible community, cultural & recreational opportunities
Healthy, safe & walkable transit corridor neighborhoods

Source: CFA Consultants
## Using the Calculator

![Image of table and text](Image)

**Location Efficiency.** Housing-plus-transportation (H+T) cost indices influence location decisions made by residents, employers, and developers, by communicating the benefits of access to transit, distance to destinations, and compact mixed-use development. Location-efficient mortgages are being offered to homebuyers in some high-density, transit-rich urban areas as a way to bring more investment to these communities and increase the availability of affordable housing.

**Housing Production and Targets.** Government agencies and nongovernment organizations can offer real estate expertise and financial assistance to help developers, landowners, and financial institutions overcome barriers to housing production to increase affordability.

**Regulatory Streamlining.** Housing production can be encouraged by addressing regulatory obstacles to development, such as excessive parking requirements, restrictive setback and height requirements, high fees, and lengthy development approval processes.

*Source: CFA Consultants and Taecker Planning & Design*
**STEP 4: SELECT STRATEGIES TO ADDRESS METRIC PERFORMANCE**

This worksheet allows you to assess the characteristics of your corridor across all livability metrics. Place your cursor over the small red triangle at the top right corner of the metric in order to read its definition. Select strategies here (by clicking the checkboxes) in order to address concerns about your corridor’s characteristics. Proceed to the next worksheet to view a summary of the selected strategies.

Metrics colored in red indicate a Principle where your corridor is consistent with Emerging corridors, metrics colored in yellow indicate a Principle where your corridor is consistent with Transitioning corridors, and metrics colored in green indicate a Principle where your corridor is consistent with Integrated Corridors.

<table>
<thead>
<tr>
<th>PRINCIPLE</th>
<th>METRIC PERFORMANCE</th>
<th>SELECTED STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-quality transit, walking, and bicycling opportunities</td>
<td>Transit jobs accessibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transit service coverage</td>
<td>Regional Connectivity: Connected Network Planning, Circulous Route Retrofits, Transit Frequency and Reliability, Last-Mile Shuttles, Jobs-Housing Alignment, Activity Center Master Plans, Regional Competitiveness, Station Area Profiles to Identify Jobs or housing growth opportunities, Compact Development</td>
</tr>
<tr>
<td>Mixed income housing near transit</td>
<td>Housing unaffordability</td>
<td>Affordability: Location Efficiency, Transit Pass Subsidies, Regulatory Streamlining, Inclusionary Housing, Local Housing Trust Funds, Anti-Displacement Strategies, Land Assembly &amp; Joint Development, Station Area Profiles (development site identification)</td>
</tr>
<tr>
<td></td>
<td>Income diversity</td>
<td>Vary: Housing Production &amp; Targets, Regulatory Streamlining, Inclusionary Housing, Land Assembly &amp; Joint Development, Station Area Profiles (development site identification)</td>
</tr>
</tbody>
</table>

**REGIONAL ACCESS**
- Connected Network Planning
- Circulous Route Retrofits
- Transit Frequency and Reliability
- Last-Mile Shuttles
- Jobs-Housing Alignment
- Activity Center Master Plans
- Regional Competitiveness
- Station Area Profiles to Identify Jobs or housing growth opportunities
- Compact Development

**CONNECTIVITY**
- Connected Network Planning
- Circulous Route Retrofits
- Complete Streets
- Last-Mile Shuttles
- Pedestrian and Bicycle Network Maintenance

**DEMAND MANAGEMENT**
- Alternative Modes
- Circulous Route Retrofits
- Parking Management and Requirements
- Transit Pass Subsidies
- Zoning Overlay Districts
PLANNING METHOD
Case Studies

Literature and Interviews: 10 Corridors

- Boston – Orange Line
- Chicago – Milwaukee Avenue
- Dallas/Fort Worth – Trinity Rail Express
- Indianapolis – Meridian Street
- Los Angeles – Orange Line & Red Line
- Minneapolis/St Paul – Hiawatha Line
- Philadelphia – North Broad Street
- Portland – Blue Line East
- St Louis – Grand Boulevard
Reasons for Planning Method

- Align Agencies and Stakeholders
- Recognize Corridor Differences
- Tailor Assessments
- Share Goals & Vision
- Promote Implementation
### Some Common Applications

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>TYPICAL LEAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure Plan (within land use context)</td>
<td>Transit Agency</td>
</tr>
<tr>
<td>Corridor Plan (within existing setting)</td>
<td>MPO</td>
</tr>
<tr>
<td>Station Area (within larger context)</td>
<td>Local Jurisdiction</td>
</tr>
<tr>
<td>New Town Masterplan (managed growth)</td>
<td>Developer</td>
</tr>
</tbody>
</table>

Source: CFA Consultants and Taecker Planning & Design
5-Step LTC Planning Method

1. Initiate Project
   - Gather Stakeholders
   - Tailor Work Plan
   - Assign Roles

2. Assess Corridor
   - Apply Metrics
   - Describe Strengths and Needs

3. Identify Goals
   - Identify Corridor Goals
   - Refine Assessment

4. Develop Vision
   - Analyze Scenarios
   - Develop Vision & Plan

5. Plan for Implementation
   - Finalize Goals & Vision
   - Develop Strategies

Source: CFA Consultants and Taecker Planning & Design
1. Initiate Project

- Federal & State DOT
  MPOs & COGs
  Transportation Authority & Transit Implementation

- Local Government
  Land Use Authority & Street Implementation

- Developers
  Financial Institutions
  Community Members
  Land Use Implementation

Source: CFA Consultants, Taecker Planning & Design and San Diego State University
1. Initiate Project

Source: CFA Consultants, Taecker Planning & Design and San Diego State University
2. Assess Corridor

Metric-Based Analysis
2. Assess Corridor

Metric-Based Analysis

EXAMPLE OF CALCULATOR SCORES
Observed corridor “z-score” compared with mean for each corridor type.

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</tr>
<tr>
<td>Housing Affordability</td>
<td>Income Diversity</td>
</tr>
<tr>
<td>-1.00</td>
<td>-0.50</td>
</tr>
<tr>
<td>-0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>0.50</td>
<td>0.10</td>
</tr>
<tr>
<td>1.00</td>
<td>0.15</td>
</tr>
<tr>
<td>1.50</td>
<td>0.20</td>
</tr>
<tr>
<td>2.00</td>
<td>0.25</td>
</tr>
<tr>
<td>2.50</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Source: CFA Consultants
3. Identify Goals

Technical and Community Guidance

Technical Committee Work and Community Workshops

Source: Dyett & Bhatia
3. Identify Goals

Community Corridor Workshop
California Highway 29 Corridor Plan and Process (Napa area)

Source: Dyett & Bhatia
3. Identify Goals

Community Corridor Workshop Results
California Highway 29 Corridor Plan (Napa area)

Community Guidance
Transportation, Land Use, and Design

Source: Dyett & Bhatia
4. Develop Vision and Plan

Orange Line Sustainable Corridor Implementation Plan.
Source: Raimi+Associates, et al. for SCAG.
## 5. Plan for Implementation

**Goals & Strategies:** Example for High-Quality Transit, Walking, and Bicycling

<table>
<thead>
<tr>
<th>Goals</th>
<th>Strategies</th>
</tr>
</thead>
</table>
| **Regional Access**    | • Connected network planning  
                         | • Circuitous route retrofits  
                         | • Transit frequency and reliability  
                         | • Last-mile shuttles  
                         | • Compact development |
| **Regional Connectivity** | • Connected network planning  
                          | • Circuitous route retrofits  
                          | • Last-mile shuttles  
                          | • Complete streets  
                          | • Pedestrian and bicycle network maintenance |
| **Demand Management**  | • Alternative modes  
                         | • Parking management and requirements  
                         | • Transit pass subsidies  
                         | • Zoning overlay districts |

Source: CFA Consultants
5. Plan for Implementation

GOVERNMENT FRAMEWORKS

State-Level Declarations
Federal Programs and Grants
Regional Blueprints and Infrastructure
TOD Guidelines
TOD Technical and Implementation Grants
Coordinate Station Area Plans

Source: Taecker Planning & Design
Coordinating Local Decisions & Transit Investments

Corridor Type, Local Decisions and Transit Investments

Enhanced Service

Integrated Corridors

Transitioning Corridors

Emerging Corridors

Enhanced Land Use & Design

Local Progress Toward Transit-Oriented Development

Source: CFA Consultants and Taecker Planning & Design
Important contributions to this project were made by:

- Michael Carroll (CFA)
- Caleb Schroeder (SDSU)
- Courtney Armusewicz (SDSU)
- Chris Allen (SDSU)
- Alexander Frost (SDSU)
- Eduardo Cordova (SDSU)
- Jeremy McKinstry (SDSU)
- Evan Casey (SDSU)
- Ardisher Beheshti (SDSU)
- Reid Ewing (Univ. Utah)
- Arthur C. Nelson (Univ. Utah)
- Herbert Levinson
- C.J. Gabbe (Fregonese)
- Alex Joyce (Fregonese)
- John Fregonese (Fregonese)
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  - bappleyard@mail.sdsu.edu
  - Please feel free to contact Dr. Appleyard with any interests in research analysis for future projects on:
    - Transit-Oriented Corridors, Transit-Oriented Development, Social Equity Analysis, Housing Affordability, Smart Growth, and the Livability Calculator
QUESTIONS AND DISCUSSION
References

- Appleyard, Ferrell, & Taecker. 2016. “Toward a Typology of Transit Corridor Livability: Exploring the Transportation/Land Use/Livability Connection.” Transportation Research Record: Journal of the Transportation Research Board.