Sustainable Cities & Regions

Transforming Office Parks into Transit Villages

- Steve Raney, Cities21, Palo Alto
- Cut family energy use by 75%
- Background
  - Regional Planning / Trends
  - Smart Growth / Land Use
- Way out there" solutions
  - Jobs next to housing
  - Culture / behavior
  - Flexpooling – human goodness
  - The final frontier: parking!
  - Personal Rapid Transit, etc..

This research is funded by
U.S. EPA - Science To Achieve
Results (STAR) Program
Grant # X3832210

Global warming & Peak Oil

- Is the U.S. doing enough?

- Sacrifice?

- 85% high-schoolers pessimistic
  - Self-fulfilling.

21.org

Beware LEED CZ

- Cubic Zirconia – fake green
  – Suburban sprawl
- Auto-oriented development
  – Rely on auto for almost all trips
- Single use, low density development
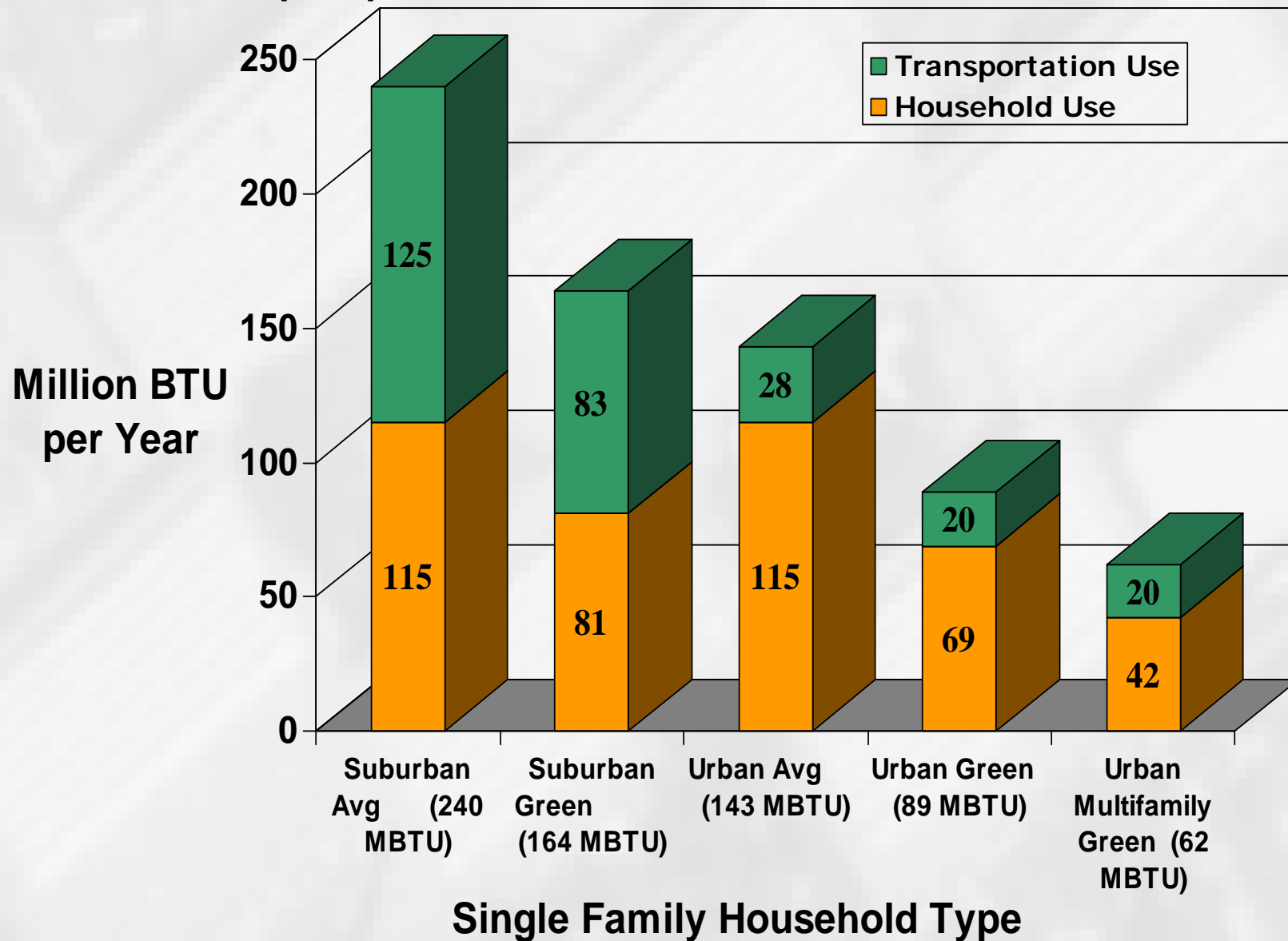- Separate shopping & working
- LEED ND begins to address.

Love drivers, hate walkers

Pedestrians in the Conventional Suburban Environment

Family Energy Consumption
Suburban: disproportionate to rest of world

Million BTU per Year

Legend:
- ■ Transportation Use
- ■ Household Use

Data values by Single Family Household Type:

Household Type	Transportation Use	Household Use
Suburban Avg (240 MBTU)	125	115
Suburban Green (164 MBTU)	83	81
Urban Avg (143 MBTU)	28	115
Urban Green (89 MBTU)	20	69
Urban Multifamily Green (62 MBTU)	20	42

Single Family Household Type

Smart Growth Magic
- Streetscape and circulation Improvements

Slide # 7, steve_raney@cities21.org

Slide # 8, steve_raney@cities21.org

Slide # 9, steve_raney@cities21.org

Regional Visioning / Trends

- 30 big U.S. metro regions are "visioning"
  - Fregonese Calthorpe has 80% market share of these studies
- 25 years, 50% population growth
  - Smart growth scenario, 40% mileage increase
    - Sprawl ➔ 50%
  - Things get worse. Only slows the acceleration of degradation
  - Current Smart Growth is good, but not a solution
    - Need more, bigger, smarter SG faster, dang it!
- Prepare yourself for Cities21 solution
  - Complex, comprehensive, outside-the-box
  - "not too bad."

Efficient Human Settlement Patterns

- For each person, minimize the distances in the triangle below. Miles ➜ feet
  - 4 story new urbanist mixed use transit village ➜ less than 50% car trips (walk > transit)
    - (GB Arrington, TCRP 102) – "walk to quart of milk"

- πr^2 :: pipes, wires, streets, distribution. Infrastructure cost savings in the billions for Envision Utah. (25% -TCRP 74)

Home ⟷ Job

Activities
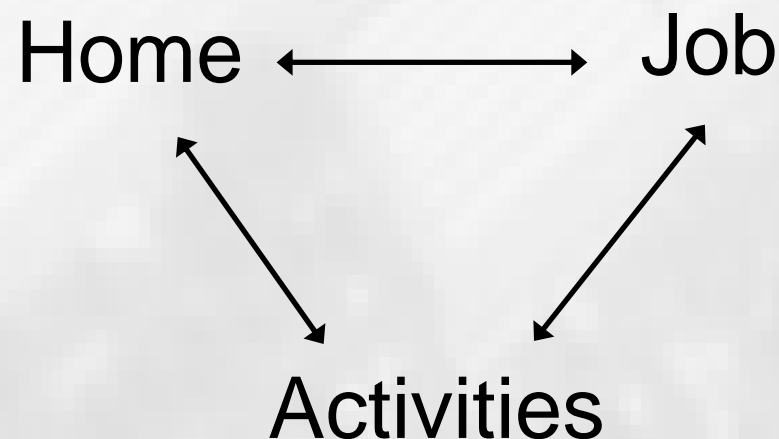
Goals

- 62 MBTU, not 240 ➔ Kyoto
  - Can fed Govt cut family energy by 75%?

- Lower cost of living + upward mobility

- Profit (no govt $ to scale up subsidized program) ➔ viral

- Unleash human goodness

- ➔ stomp pessimism: show method to solve big problems.

End of Background

- "Way out there" solutions
  - Jobs next to housing
  - Culture / behavior
  - Flexpooling – human goodness
  - The final frontier: parking!
  - Personal Rapid Transit, etc..

Traffic Reducing Housing

- Priority access to new housing for green commutes
  - Waiting list
  - Green: transit, carpool, bike, short drive
- The most cost-effective suburban traffic reduction policy (ever) .

Home ⟷ Job

Activities
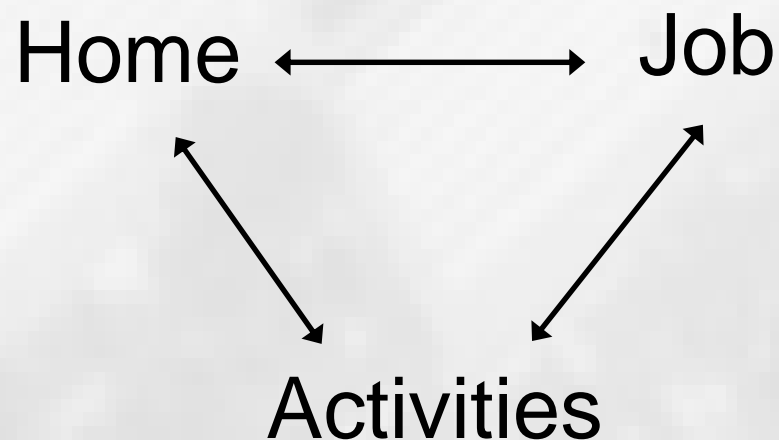
3 Traffic Reducing Hsng Examples

- Santa Barbara: 42 affordable apartments
  - 40 block walkable, mixed-use downtown
  - Priorities: no cars, work downtown
  - Result: TWENTY cars
- Stanford West: 515 apartments
  - Shuttle bus, biking, hostile to cars
  - 396 Stanford, 96 hospital, 14 Palo Alto, 9 long commutes
  - 10% short-commute rent discount
  - 1,200 less tons CO2/yr
- Redwood City: 800 condos
  - 1 mi from dwntn, bike path
  - Cities21 victory
  - 4 months: green commutes
- 1MM homes: 3MM tons/yr.

Culture: Low Mileage Community

- Exploit human behavior research

- Non auto-centric culture

- Good Deed Doing (make it easy. Comes out in interviews w/ tech workers)

- EBay's online community phenomenon
  - Make friends, achieve social status
  - Self polices bad behavior

- "Communities of Practice" – expertise around a problem domain (less auto mileage).

Low Mileage Scheme

- Big new residential complex
- Everyone signs low mileage pledge
  - Entry condition to obtain housing
  - People are "self-consistent"
- Manufacture a tipping point
  - Positive peer pressure
- Problem-solving think tank. Online & in person
  - Carpool to grocery store, delivery services
  - Ex: Biking learning curve: route, gear, defensive
    - People love to share such self-discovered expertise
- ➔ political will for Pew's govt solutions.

Flexpooling

- Exploit GIS patterns
- Bus + safe hitchhiking
- RFID & cellular.
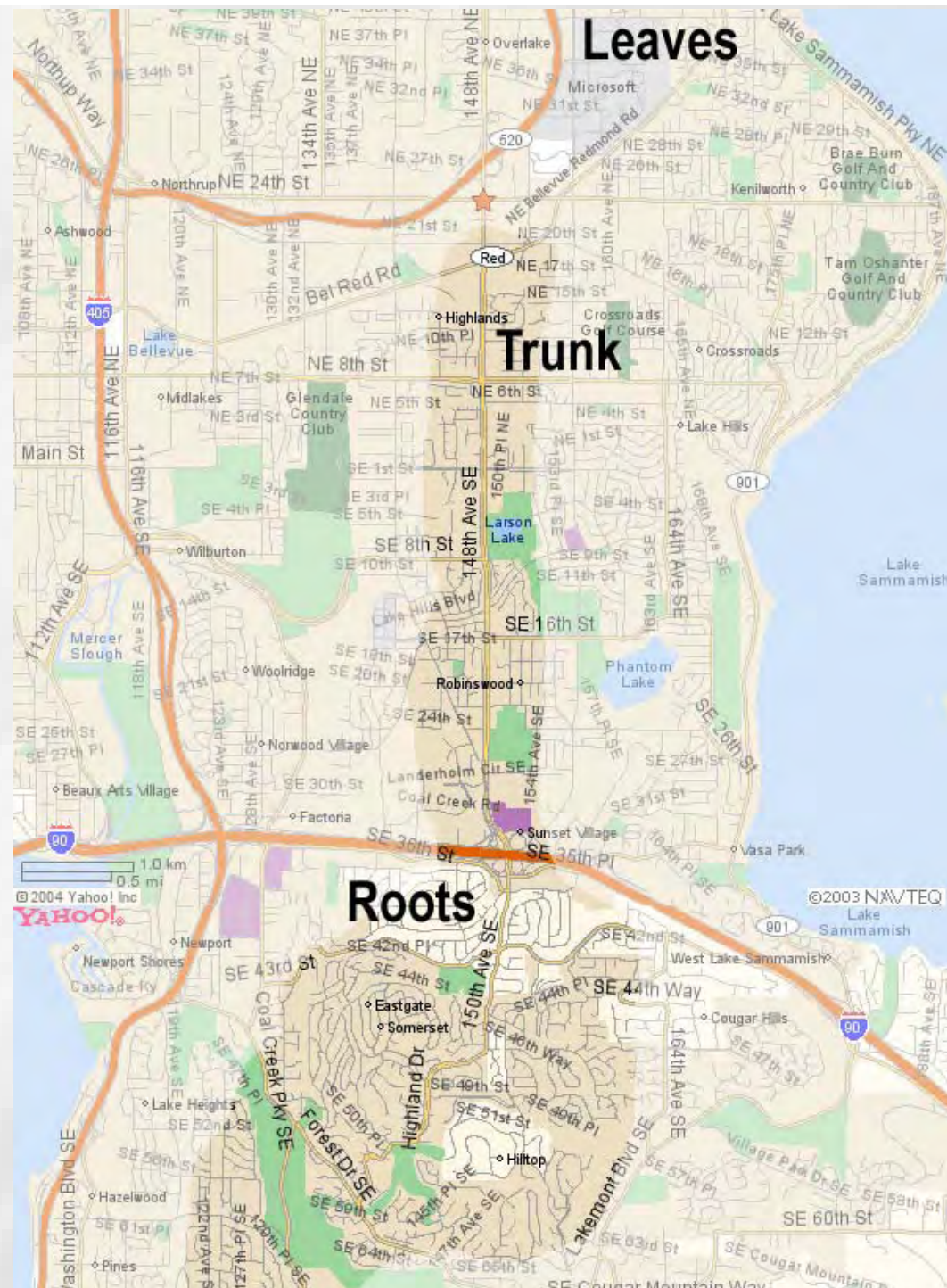
Paid Parking / Tragedy of Commons

- Paid parking (at suburban offices) reduces commute trips (and CO2) by 23%
- Tragedy of the Commons – no office wants to be the first to charge ➔ less competitive.
- Need to all "jump in together"
  - Example: smoking ban in bars: Bloomington, St. Paul, Minneapolis
- A Cities21 advocacy attempt.
  - Redevelop parking spaces & distribute "found" wealth
  - Start with $1 per day & increase each year.

Halve SOV Commutes

- Goals:
  - Remove many cars from suburban offices
    - Current: 80% drive alone, little transit, some carpool
  - Intensify land use / **reclaim parking lots**

PRT – Personal Rapid Transit

- Feeder / Distributor / Circulator
  - Similar to a monorail. Video, MS Campus
- High service level, no waiting, faster than a car.
  - Non-stop, 30 MPH
  - Bypasses intermediate stations
  - Ride alone or with 1-2 people you choose
  - Convenient stops by buildings (not on street)
  - Comfortable, quiet, safe, no exhaust
  - 24x7
- 6 development efforts underway
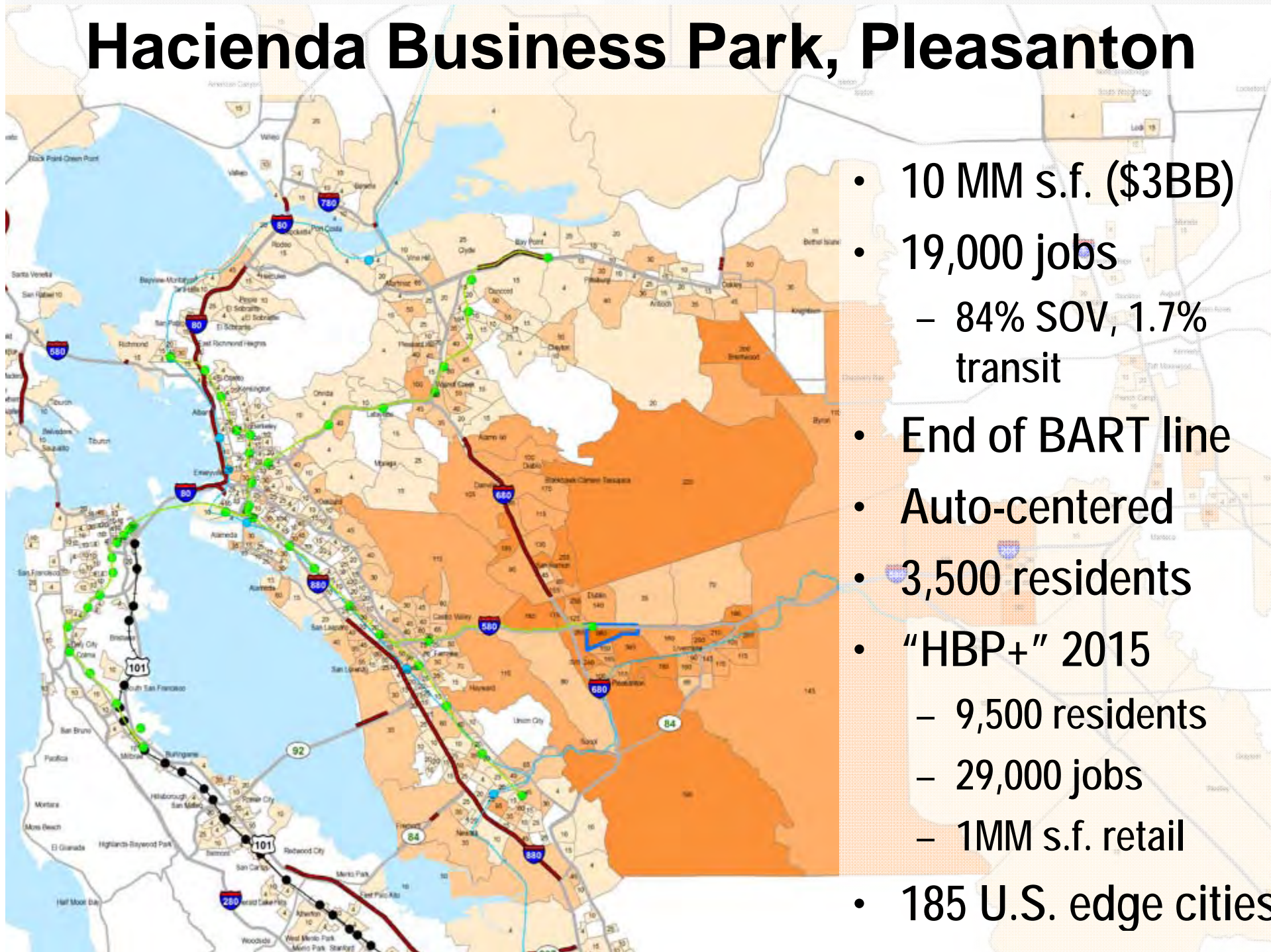 - UK, Sweden, Korea, MN, TX, Dubai.

Hacienda PRT

- 15 mi one-way track
- 47 stations
- Huge transit village

Slide # 22, steve_raney@cities21.org

Hacienda Business Park, Pleasanton

- 10 MM s.f. ($3BB)
- 19,000 jobs
  - 84% SOV, 1.7% transit
- End of BART line
- Auto-centered
- 3,500 residents
- "HBP+" 2015
  - 9,500 residents
  - 29,000 jobs
  - 1MM s.f. retail
- 185 U.S. edge cities
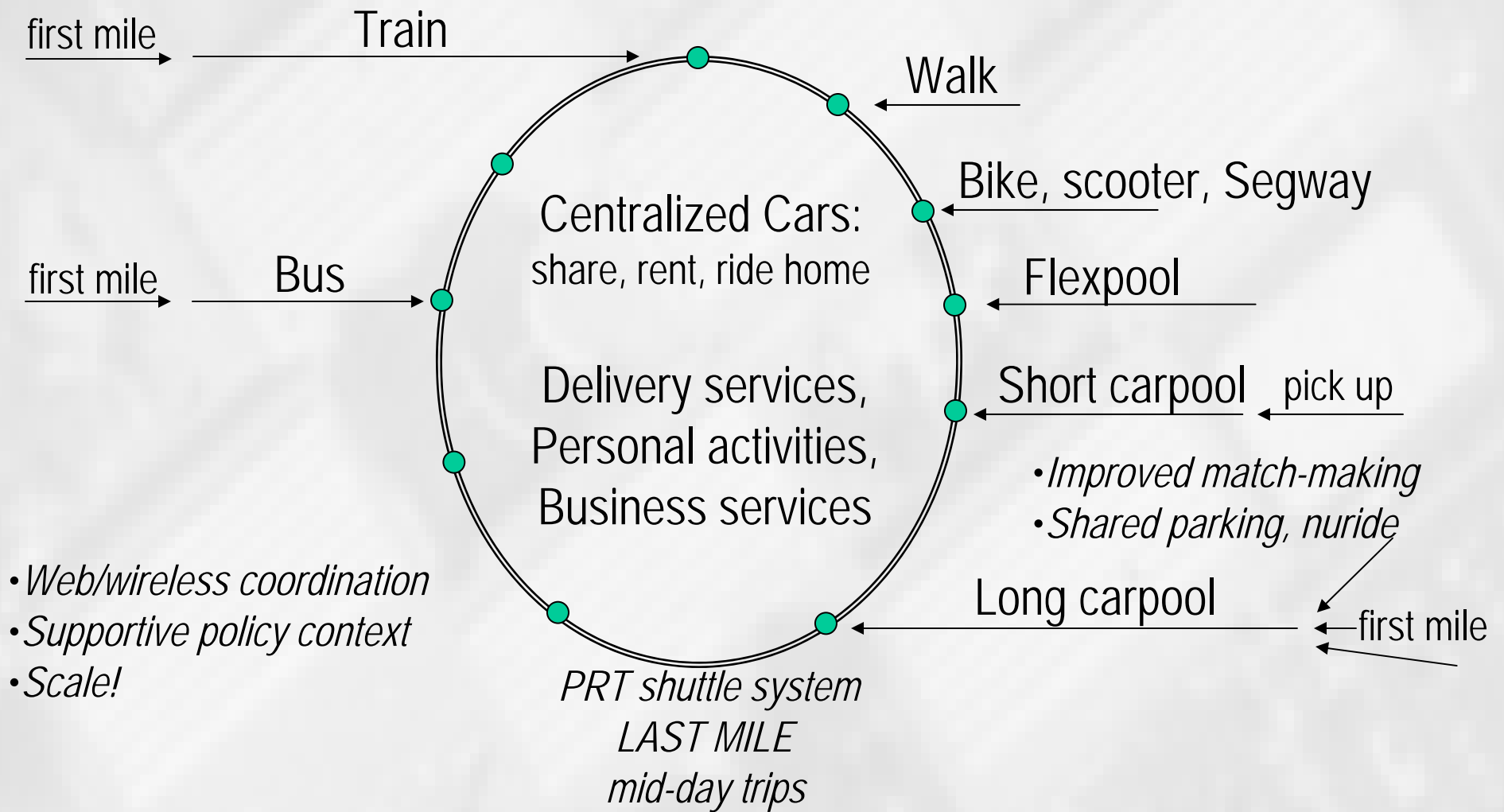
Promising Results (85 surveys)

	current mode %	2010 mode %
bike /ped	4.20	10.34
bus	4.08	8.63
carpool	5.99	13.57
flex pax	0.00	4.37
train	10.51	21.28
SOV	73.09	41.84

- Remove 5,000 autos, in-fill 50 acres
  - Huge transit village ➔ land value increase
- 1.4 PRT trips/day/person => PRT: profitable
- Apply to 6M workers in major emp. centers
  - 1.98M cars, 12B VMT, 424M gals, 4MM tons CO_2 .

Comprehensive, Integrated Mobility

Door to Door

first mile → Train

Walk →

Bike, scooter, Segway →

first mile → Bus →

Centralized Cars:
share, rent, ride home

Flexpool →

Short carpool ← pick up

Delivery services,
Personal activities,
Business services

• Improved match-making
• Shared parking, nuride

• Web/wireless coordination
• Supportive policy context
• Scale!

Long carpool ← first mile

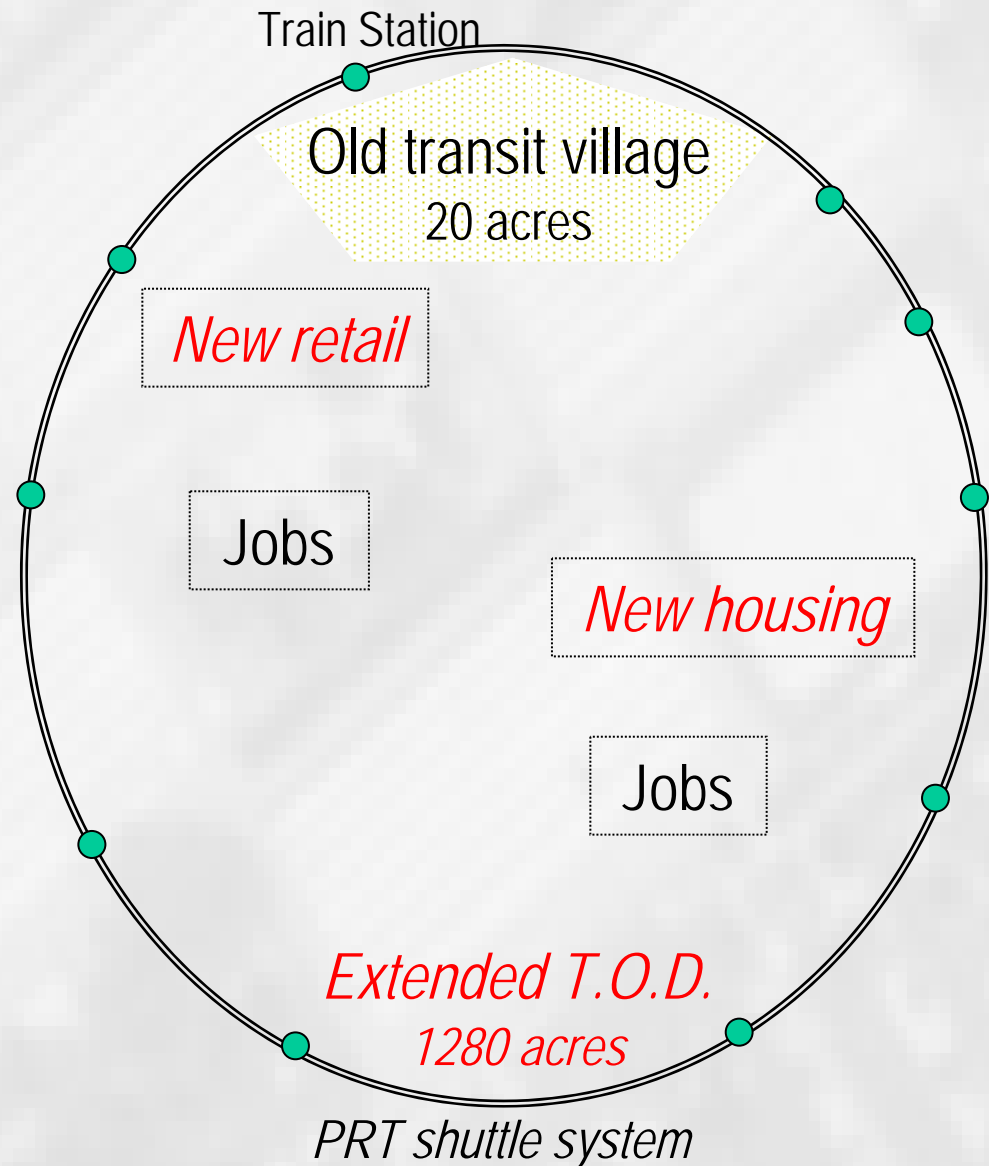PRT shuttle system
LAST MILE
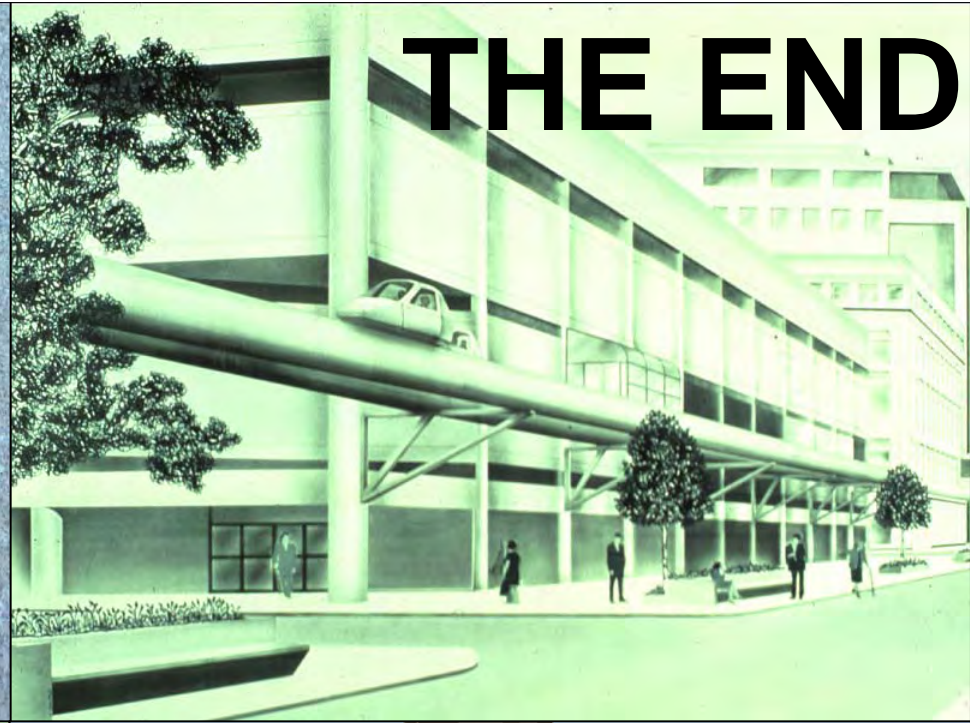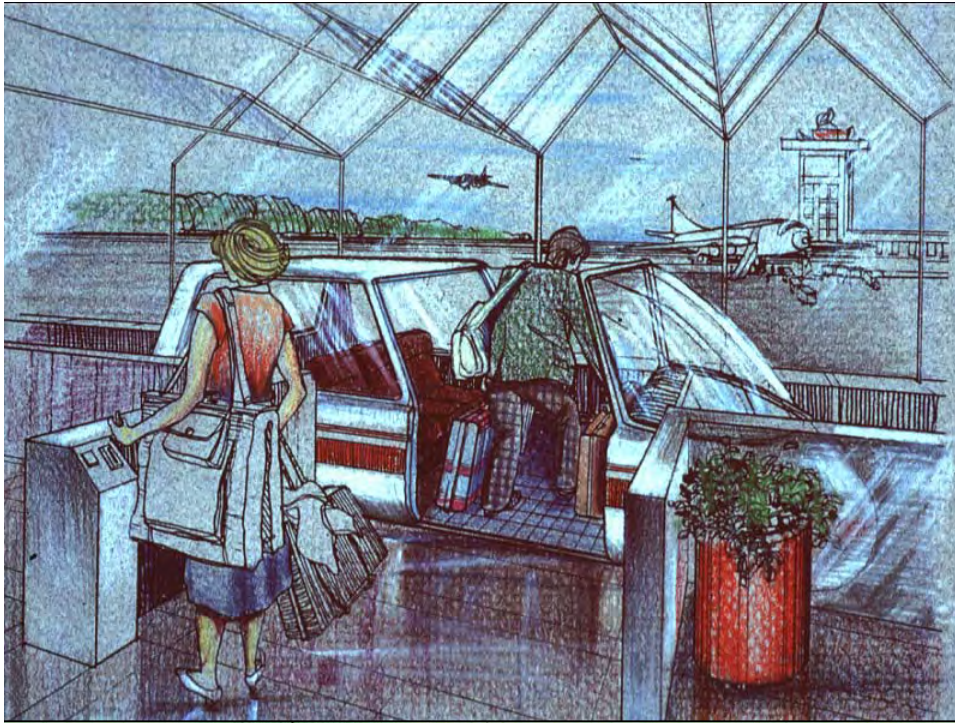mid-day trips

Cellular Solutions

- ## Marauder's Map (GPS)
  - Transit, rideshare connections
    - Like NextBus
  - Get home safe (Big Sister is watching).

"New Suburbanist" Transit Village

Ever-expanding walkable areas.

Train Station

Old transit village
20 acres

New retail

Jobs

New housing

Jobs

Extended T.O.D.
1280 acres

PRT shuttle system

Slide # 27, steve_raney@cities21.org

THE END

THE END

Quantum Innovation / Public Policy

- Political subsystems favor incremental change
  - ag, defense, energy, transit, healthcare, edu, etc.
- Innovations produce winners & losers
- Public sector: huge penalty for failure
- Media stifles innovation, accentuates conflict
- Macropolitical system can impose quantum change – earmarks, etc
  - '79+: mature democracy, entrenched interests
- Billionaires & tech foundations: quantum
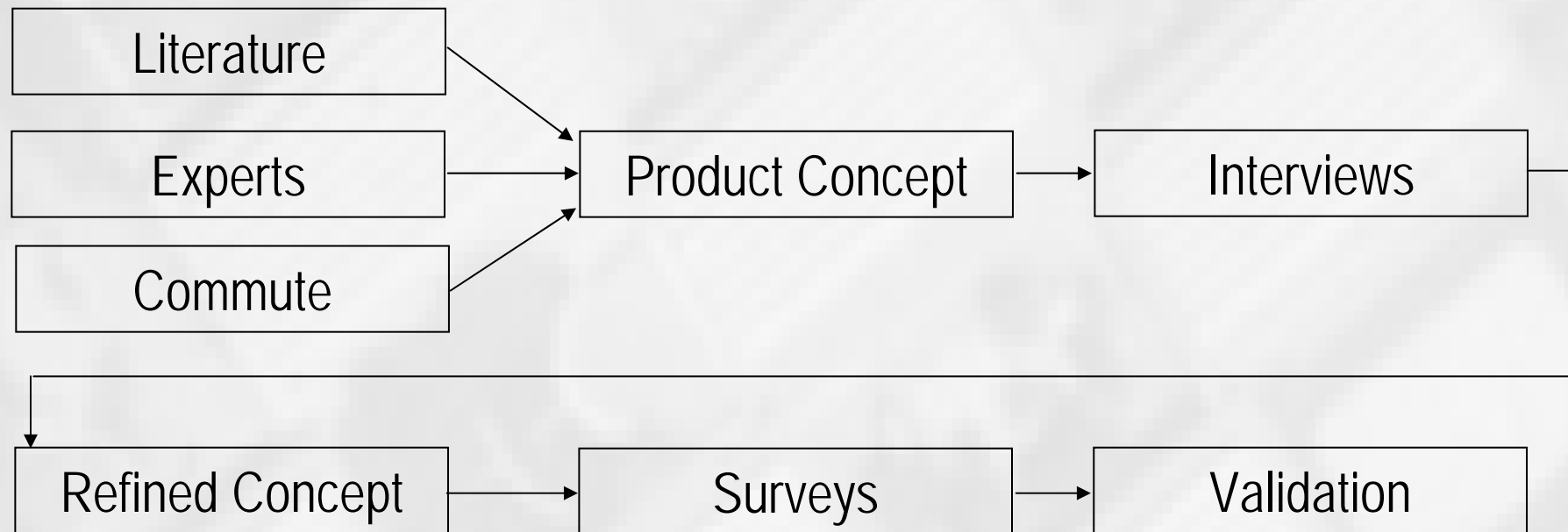- Strong govt: Dubai, China.

Social Entrepreneurism

- Act local (small $), think global
  - Fix 1 city ➔ world is saved
    - (viral spread, mutation)
- Govt is not the solution
  - resistant, but good follower.

How to
CHANGE
the
WORLD
Social Entrepreneurs
and the Power of New Ideas

By David Bornstein

Customer-Centered Product Research

```
┌──────────────┐
│  Literature  │──────┐
└──────────────┘      │
                      ▼
┌──────────────┐  ┌─────────────────┐     ┌──────────────┐
│   Experts    │─▶│ Product Concept │────▶│  Interviews  │──┐
└──────────────┘  └─────────────────┘     └──────────────┘  │
                      ▲                                      │
┌──────────────┐      │                                      │
│   Commute    │──────┘                                      │
└──────────────┘                                             │
     ┌───────────────────────────────────────────────────────┘
     ▼
┌──────────────────┐     ┌──────────────┐     ┌──────────────┐
│ Refined Concept  │────▶│   Surveys    │────▶│  Validation  │
└──────────────────┘     └──────────────┘     └──────────────┘
```

- Deakin says we need it. Silicon Valley style
- New technology bias
  - High touch / community building is natural
  - Takes on personality of researching organization
- Start with rough business case in mind and refine.

Customer Centered Research

- Large solo driving reduction is hard
- Last mile problem is very important
  - Mid-day trips: 2X value of time
  - Workers are unhappy with bus shuttles
- Each commuter: basket of objections
  - PRT last mile is important, but not sufficient
- 30% time penalty: OK
- Carpool psychology is complex:
  - Matchmaking: anonymous, superficial rejection (web dating)
  - Sleep, uncertainty stress, and safety are important
- Short Caltrain or carpool with PRT: OK
- Customer support: eliminate nightmares
- Stranding: want "no penalty" emergency ride home
- Good commute: "time went fast."

Slide # 33, steve_raney@cities21.org

5 PRT Development Efforts

- ULTra, Cardiff, Wales (1km track, 2 vehicles)
  - Won Heathrow System RFP
  - $10M investment by British Airport Authority
- Korean Posco/Vectus for Uppsala, $40M
- Korea Railroad Research Institute: $30M
- Skyweb Express / Taxi2000, MN
  - (60' track, 1 vehicle). Scale model
- Microrail, TX (60' track, 1 vehicle)
- Dubai procurement
  - no public review!.

PRT Investor Due Diligence

- The Team – entrepreneurial cost control, etc.
  - IBM vs. IBM skunk works. Golem Group
- Control system design (architect spends 1/3 of time writing safety documentation)
- Control system safety certification
  - Public utilities commission?
  - Each SW "version" requires painful re-certification
- Annual operating costs
  - Video surveillance, etc.
  - Insurance for the first system will be high
- Switch reliability (1 fail out of 2M trips ➔ 50 days)
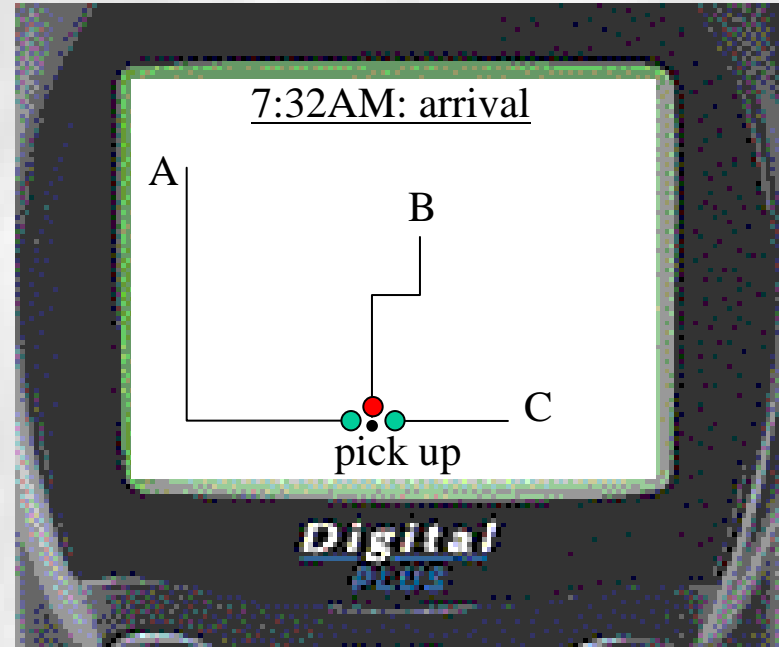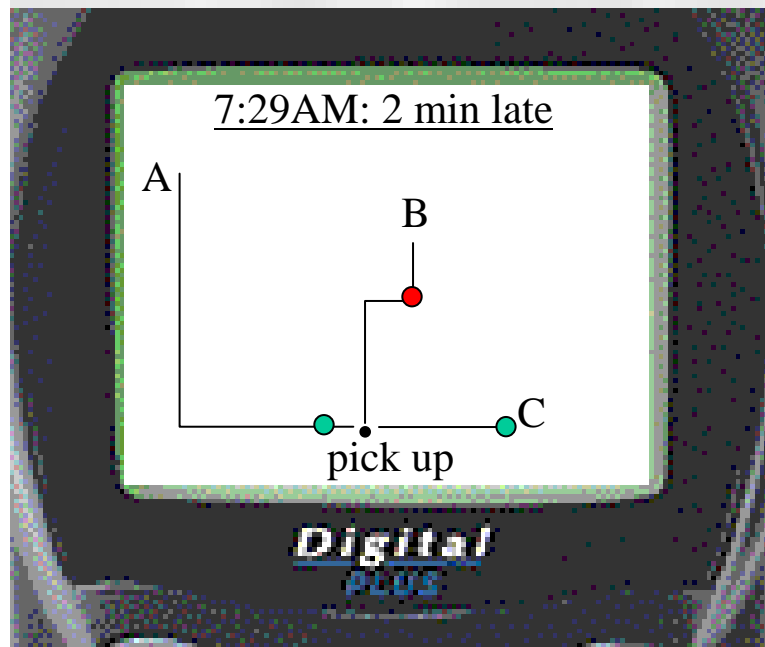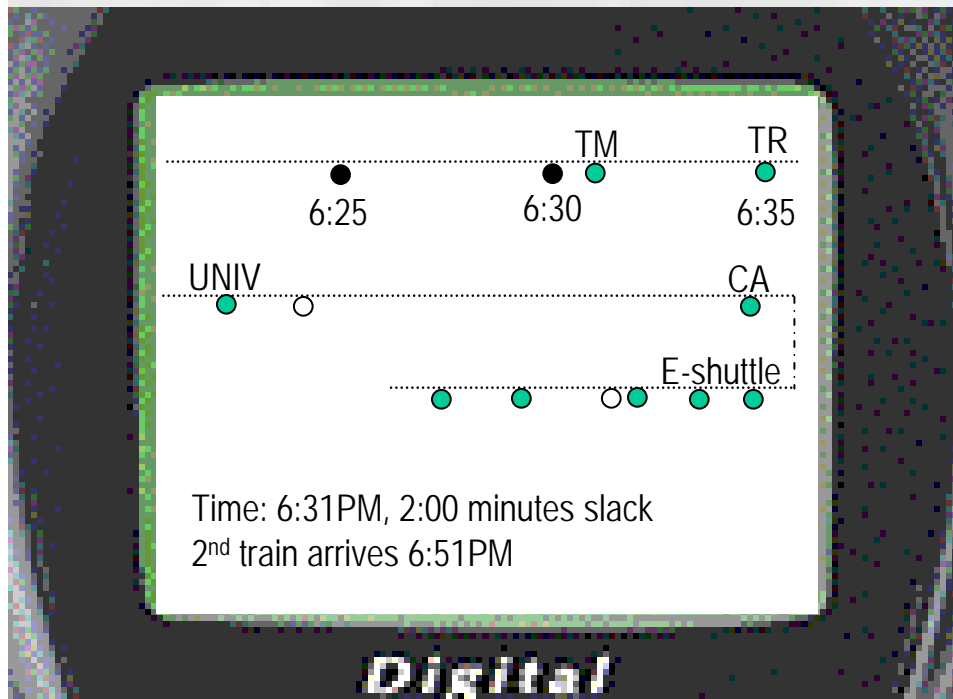- Performance degrades near capacity (wave-offs).

TrakRide

7:20AM: on time

AM pickup
A: 10 min
B: 7 min
C: 3 min

SMS nudge to
A at 7:10, 7:15

7:25AM: 2 min late

A departs OK
B is 2 min late
C delays 2 min

Encourages
punctuality,
courtesy.
Eliminates
uncertainty.

7:29AM: 2 min late

7:32AM: arrival

NextTrain

Time: 6:24PM
2nd train arrives 6:50PM

Time: 6:31PM, 2:00 minutes slack
2nd train arrives 6:51PM
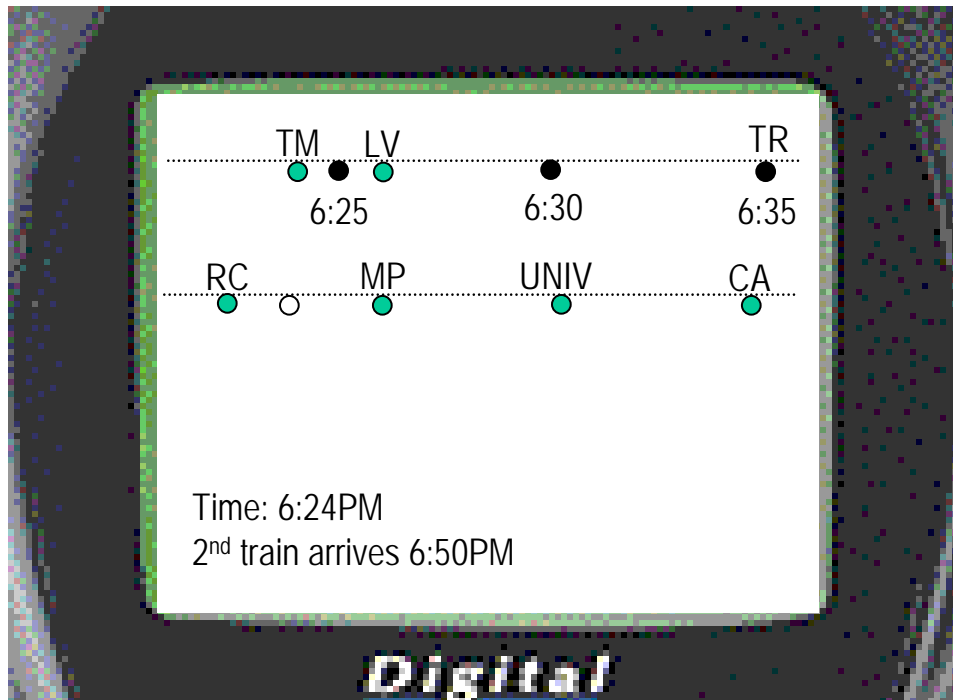
- When to leave desk
- Race to train station
  - Worker must "win"
- PRT wait = fcn(demand)
- Slack

- TR: 6:35PM train is on time
- Every 30 sec, recalculate
  - TTAT: time to access train = 1 min walk + 1 min wait + 4 min PRT + 1 min walk + 2 min slack
  - LV = TR - TTAT
  - TM: current time
- Small beep @ 5, 2 min to LV
- NextTrain orders PRT vehicle 2 min before LV

PRT Office Park Economics

COSTS	$M
PRT capital costs, 5 mi	50.0
Shared, automated parking	4.9
Annual PRT O&M	3.0
Pedestrian landscaping	?
ROW acquisition	0.0

ANNUAL REVENUE	$M/year
PRT farebox	4.9
Caltrain increment	2.7
Ads - personal + wraps	3.5
6,600 parking sp. reduction	4.0
Eliminate bus shuttles	0.3
$0.50 daily smart parking	1.3
Use guideway for utilities	0.3
total	16.9

OTHER REVENUE	$M
50 acre housing profit	326.3
-1% job turnover/yr	20.0
Worker hsng preference	?
35% retail sales increase	?
cellular carrier preference	?
Exclusive delivery franchises	?

3 stage path to sustainability (Risse)

- Can't go straight there

- 1) Populist: Consciousness raising, recycling, sea bass, Prius, non-threatening to government

- 2) Fundamental: efficient human settlement patterns. Land-use conversant population, government restructuring. Green building

- 3) Profound: 80% NRG & resource reduction, 4B population, accurate pricing, renewable NRG, diet restructuring, anti-materialism, lower GNP, etc