Commission on the Future of Transportationin the Commonwealth:

Listening Session Notes

MASSACHUSETTS COMMISSION ON THE FUTURE OF TRANSPORTATION

LISTENING SESSION: AUTONOMOUS VEHICLES
MAY 29, 2018

Moderator: Secretary Stephanie Pollack
Commission Members: Karen Sawyer Conard, Andy Hogeland, Sandra Sheehan
Speakers: Shlomo Zilberstein, Shannon Roberts, Eric Gonzales

Excluding staff, commission members, and speakers, about 50 people attended the event. A summary of remarks is provided below.

SPEAKER REMARKS

1. Professor Zilberstein described the nature of his research on intersections and "mid-level decision-making" (real-time decisions on whether to stop, go, and yield). The decisions that cars have to make are complicated – they need to respond appropriately to 4-way stops, bikers, pedestrians, and social norms such as gestures. Zilberstein also stressed that it is too difficult to predict how AV developments will unfold – made more difficult by the presence of "unknown unknowns" (referencing Donald Rumsfeld's famous quote). The most extreme predictions, for example, say that the auto industry will be extinct, non-autonomous cars will be illegal in some places, and AVs will be 95% of market share by 2040. Moreover, companies have been saying that AVs are 3-5 years in the future every year since 2012. They have invested more than $80 billion in AVs – mostly in research – in the last two years alone.

2. Professor Roberts gave examples of ways in which the general population is not quite ready for an AV-dominated world. Though drivers already interact with autonomous features such as adaptive cruise control, these features often come with unintended behavioral consequences (e.g., adaptive headlights led people to drive faster). Furthermore, a semi-autonomous vehicle costs a whopping $50,000 – and the people who want AVs tend to be "young, high-income, tech-savvy men who live in cities."

3. Professor Gonzales explained the distinction between "ride-sharing" and "ride-sourcing" companies. The former involves the sharing of cars so that fewer cars are on the road. The latter resembles a taxi service that puts cars on the road that otherwise wouldn't be there. Since developments in the AV space will likely start

with "ride-sourcing" companies, AV profit models will not necessarily align with public interest. For example, Lyft and Uber benefit from an oversupply of drivers – leading to congestion in popular places. In Manhattan, there are now 4 times as many TNC vehicles as taxicabs and they are cruising without passengers 40% of the time. It is unclear whether efficiency gains will outweigh the harms of increased vehicle miles traveled. Questions we should be asking include: What role do we want TNCs to play? What unintended outcomes could there be? What regulations should we put in place? And how will we ensure outcomes are equitable?

Q&A

1. Hogeland: How will developments unfold in rural areas?
   Zilberstein: It depends. Rural infrastructure is not as well maintained. It's a less structured environment. Roads are darker. So cars will have trouble seeing lanes. Highway deployment has the highest likelihood.
   Gonzales: TNCs are less efficient in low density areas. AVs may offer the opportunity to overcome some equity issues. Human drivers, for example, rarely provide wheelchair access because they don't have incentives to do so.

2. Pollack: How can we assess the adoption/uptake rate? Will there be signposts or ways to reduce uncertainty?
   Roberts: You can look at environmental effects such as GHG increase. You can also look at locations of deployment and whether negative impacts are exacerbated in those places.
   Zilberstein: Not really – when it happens, it will happen quickly. We should start working now on regulations and building infrastructure. Car companies have started working despite uncertainty because they can't afford to wait.
   Gonzales: Developments in freight may happen earliest due to high cost-saving potential and highway presence.

PUBLIC REMARKS

1. Mike Stanley (Transit X) talked about the transportation network his company is developing – composed of "grid-separated" pods cruising above the city on suspended tracks. He stressed that it would be privately-funded and overcome the costly aspects of our current transportation system composed of overlapping and competing networks.

2. James Sproul (The Sproul Company) talked about the importance of an educational component. Can high school students be trained in the technology of autonomy and get good jobs (without a 4-year degree in engineering)?

3. Bill Carey (Liberty Mutual) asked whether there were developments on the public, "smart" infrastructure side of AVs (e.g., transmitters in cities). Secretary Pollack shared her knowledge of an RFP on an adaptive signal network in Boston's Seaport.

4. Tom Ryden (MassRobotics) stressed that the Commission should consider air transportation. Drones are a "vital part of a complete solution."

MASSACHUSETTS COMMISSION ON THE FUTURE OF TRANSPORTATION

LISTENING SESSION: ELECTRIFICATION
JUNE 11, 2018

Moderator: Eileen McAnneny
Commission Members: Eileen McAnneny, Karen Sawyer Conard, Tim McGourthy, Dan Dolan
Speakers: Eleni Christofa, Amro Farid

Excluding staff, commission members, and speakers, about 40 people attended the event. Representative Carolyn Dykema of Holliston was present. A summary of remarks is provided below.

SPEAKER REMARKS

1. Professor Christofa gave an overview of the benefits and challenges presented by electric buses. Transit agencies across the country have increasingly incorporated electric buses into their fleets (including Worcester Regional, Pioneer Valley, Massachusetts Bay, and Martha's Vineyard Transit Authority in MA). Electric buses emit fewer local emissions (particularly if sourced from clean energy), have lower maintenance costs due to fewer moving parts, and the latest models have driving ranges (426 miles) comparable to conventional buses. Procurement costs for battery electric buses (the most mature and common type of electric bus) are expected to be comparable to hybrid electric buses by 2030. Challenges to consider include:
   . Life cycle costs and handling of battery disposal/e-waste.
   a. Electricity costs, which are highly dependent on time of day. Active partnerships with electric companies are crucial.
   b. Charging infrastructure is expensive and requires numerous considerations – including type of vehicle, charging method/time, and route characteristics.
   c. Proper workforce training.
   d. Climate conditions – such as cold weather that affects range and start-up time.
   e. Numerous types of technology with differing advantages and disadvantages.

2. Professor Farid stressed that largescale integration of EV requires coordinated and evidence-based planning and decision-making by both electric grid companies and transportation agencies. Electric grid companies and transportation agencies can either work together to create synergies or stand alone to great detriment. Benefits that can be realized include: CO_2 reduction, a more efficient grid, electricity cost savings, and improved traffic patterns. However, without buy-in from both sectors, the opposite could happen. For example, everyone could charge at 6pm peak demand, overloading and destabilizing the grid. Farid recommends "intelligent transport energy systems" – where the right information is provided to EV owners at the right times with the right incentives.

Q&A

1. Conard: What should we include in our recommendations?
Christofa: Focus on infrastructure. Find the money and space for EVs. Accommodate both public and private fleets.
Farid: Get planning/infrastructure right. Focus on behavioral opportunities to bring about congestion reduction and grid resiliency. EVs will account for 50% of grid consumption.

2. McAnneny: Are there jurisdictions in the US or globally that are particularly ahead?
Farid: California.
Christofa: California. Foothill Transit. Ace Transit in SF. Antelope Transit.
Both panelists offered to forward particular documents later.

PUBLIC REMARKS

3. Gina Coplon-Newfield (Sierra Club) advocated for a rapid switch to EVs to combat pollution and climate change – focusing on 3 recommendations:
   a. Making EVs more affordable by expanding rebate programs, as well as implementing a region-wide carbon cap in the transportation sector.
   b. Accelerating electric bus adoption, as diesel bus pollution disproportionately affects low income communities and communities of color. SF has committed to an all-electric bus fleet by 2030.
   c. Improving building codes to be "EV ready" – requiring all new developments to have EV wiring/conduits (like in Atlanta). Installing wiring at time of construction is 65-74% less expensive than doing so after construction.

4. Mark LeBel (Acadia Center) emphasized the potential of EVs as "flexible load resources" on the energy grid and advocated for:
   a. The low cost integration of charging stations into building codes
   b. Expansion of electric buses especially in light of equity issues
   c. Carbon cap and investment in the transportation sector

5. Adam Thielker (Worcester Regional Transit Authority - Ridership Advisory Council) spoke of WRTA's annual fight over operating expenditures and how adoption of electric buses system-wide would lower expenses through lowered fuel costs.

6. Sujatha Krishnan (Central Massachusetts Regional Planning Commission) made 3 recommendations:
   a. Alternate routes between EV and conventional buses to have redundancy when a bus breaks down – otherwise, low-income communities are unduly burdened.
   b. Train personnel and college students on EV technology so that buses do not need to be shipped far away for maintenance.

  c. Develop a mechanism for charging people for public charging stations, which are currently free.

7. Abe Wapner (Greenlots) made 3 recommendations:
  a. Develop a robust network of public charging stations (including quick charging stations along highways).
  b. Ensure interoperability so that more than one company can operate a charging station (avoiding stranded assets).
  c. Make sure utilities are active/engaged stakeholders.

8. Matthew Poirier (USDOT - Federal Motor Carrier Safety Administration) warned of the impact and large infrastructure demands of private fleets going electric (e.g., Amazon, Walmart).

9. Jack Spence (350 Massachusetts - Transportation Working Group) emphasized the potential of battery electric buses to advance the adoption of long-haul electric truck fleets. Spence also recommended lessons from the Netherlands where 1) 50% of train travelers arrive at stations by bike and 2) EVs pay less than gas vehicles through a tiered tax structure. Professor Farid responded in agreement that battery electric buses are at the forefront of technological advancement in energy storage and have the potential to "push the ecological frontier of de-carbonization."

10. Berl Hartman (Environmental Entrepreneurs) talked about the antiquated nature of public transit – using her long bus trip to Worcester as an example. She stressed that MA has the ability to make a new vision come true (in the same way that the country incentivized car dependence by building Interstate Highways). To incentive EVs, Hartman recommended: enforcement of low mileage standards, investment in charging infrastructure, new pricing/payment structures, and educating people about the value of EVs.

11. Edmond Young (Toyota) stressed the benefits of the fuel-cell electric vehicle in terms of longer driving ranges, faster fueling, and meeting the Zero Emission Vehicle mandate. In 2014, Toyota launched the Mirai with a 3-5 minute recharge, water vapor only emissions, and ability to perform well in cold climates. Toyota is ready to expand fuel-cell electric vehicles in MA but needs more fueling infrastructure.

MASSACHUSETTS COMMISSION ON THE FUTURE OF TRANSPORTATION

LISTENING SESSION: TRANSIT AND MOBILITY SERVICES
JUNE 15, 2018

Moderator: Stephanie Pollack
Commission Members: Karen Sawyer Conard, Tim McGourthy, Carol Lee Rawn, José Gómez-Ibáñez
Panelists: Eric Gonzales, Song Gao

Excluding staff, commission members, and panelists, about 50 people attended the event. A summary of remarks is provided below.

SPEAKER REMARKS

3. **Professor Gonzales** addressed the numerous complexities of public transit and the risks and opportunities it presents. Transit investments have long-lasting impacts – e.g., the Green Line in Boston is in use today in much the same form it was in 120 years ago. Furthermore, mass transit works best with dense, steady demand – but this is not how people live. For example, there are peaks in demand (time of day and seasonal) and low density rural and suburban communities. When transit works well, numerous benefits are generated, including: 1) efficiency, 2) economic productivity through movement of large numbers of people to jobs, 3) resiliency due to the presence of alternatives, and 4) social inclusion. When considering risks and opportunities, it is useful to think about public transit modes on a continuum of flexibility – with conventional fixed route systems (e.g., heavy rail) on one end and fully flexible technologies on the other (e.g., TNCs). Risks to consider include: 1) operating systems unable to adapt to evolving needs and 2) private companies cherry-picking the most profitable corridors of transit networks, thereby depleting public transit of revenues it needs to operate more costly parts of the network. Opportunities to consider include: 1) new technologies as more efficient ways to provide services in some communities (in place of conventional fixed route systems), 2) public-private cooperation with TNCs to help those with underserved mobility needs, and 3) visionary long-lasting investments.

4. **Professor Gao** emphasized the importance of demand management, as demand for transportation is not fixed. Consumers make many different decisions – e.g., whether they need to travel at all, whether they need to do it during peak hours, and what mode of transportation they will use. Congestion pricing (implemented in London, Singapore, and Stockholm) is one notable way to manage demand. Though it comes with equity concerns, numerous studies (e.g., Netherlands) demonstrate the effectiveness of monetary incentives in changing transportation behavior.

Q&A

12. Conard: If you could advocate for anything regarding active transit or MaaS, what would it be?
Gonzales: Common goals around equity and sustainability. The policy framework needs to be ahead of the technology. Does a service make sense in and of itself or is it just what has been done before?
Gao: Make sure ride-sharing complements transit. Lyft's goals do not necessarily align with public goals. Do we want public and private ownership of ride-sharing? Just public ownership?

13. McGourthy: How do you look at infrastructure as an issue?
Gonzales: Infrastructure is important. Think about flexibility – there are ways of building things that can be upgraded.

PUBLIC REMARKS

1. Chuck Arnold (Lowell Bicycle Coalition) talked about the importance of bicycles and their equitable nature. Secretary Pollack recommended that he and others interested in the topic apply to join the MA Bike and Pedestrian Advisory Board – now calling for membership.

2. Debbie Siriani (Chelmsford Senior Center) talked about the transportation needs of older residents – including rides for medical appointments, grocery shopping, and family visits. With aging demographics, a regional approach is important.

3. Jim Scanlan (Lowell Region Transit Authority) recommended engaging private and public partners (such as local towns).

4. Cindy Barbehenn (Bedford Planning Board) talked about the difficulties of building an efficient transportation system when there are jurisdictional limitations. Suburban transit is about moving 6-8 people at a time.

5. Stacey Beuttell (WalkBoston) emphasized the importance of safety as a metric. E.g., are we reducing injuries? Beuttell also recommended focusing less on mode of travel and more on the goals of travel – such as getting to work on time, recreation, and staying healthy. "Part of life is the journey."

6. Lisa Hemmerle (City of Cambridge – Economic Development Division) discussed transportation as an economic driver. Need to work with employers on incentives such as flextime, working from home policies, and satellite offices for maintaining social interactions.

7. Andrea Leary (Merrimack Valley Transportation Management Association) emphasized the importance of looking past monetary incentives when making decisions. This includes looking at equity issues – such as populations unable to afford congestion pricing or unable to shift their hours of travel.

8. Josh Ostroff (Transportation for Massachusetts): planning shouldn't only focus on enhancing efficiency of drivers, people should be aware of other costs of driving such as GHG emissions.

9. Stephanie Cronin (Middlesex 3 Transportation Management Association) recommended user experience improvements for public transportation, and said that businesses want to be involved in improving transportation, but need more predictability.

10. Matthew Poirier (USDOT - Federal Motor Carrier Safety Administration) asked the Commission to consider what interstate movement will look like in 2040. E.g., how will people from NH be traveling to Logan Airport?

11. Tad Staley (Needham Bikes) advocated for "rail trail" projects – which convert old train tracks into recreational trails, preserving the "arteries" of MA.

12. Sreypov Vary (Cambodian Mutual Assistance Association of Lowell) advocated for compassionate transportation design – such as ensuring transportation options for low income communities and incorporating multiple languages into signage.

13. Jong Wai Tommee (Northern Middlesex Council of Governments) made 2 recommendations:
    a. Make sidewalks more uniform in design and construction to ensure pedestrian safety.
    b. Consider truck driver safety in freight planning (thinking about truck stops, rest areas, etc.).

MASSACHUSETTS COMMISSION ON THE FUTURE OF TRANSPORTATION

LISTENING SESSION: LAND USE AND DEMOGRAPHIC TRENDS
JUNE 27, 2018

Moderator: Steve Kadish
Commission Members: Steve Kadish, Eileen McAnneny, Karen Conard, Rebecca Davis, Andy Hogeland, Tim McGourthy, Steve Silveira, Kirk Sykes
Speakers: Jan E. Mutchler, Karin Valentine Goins

Excluding staff, commission members, and speakers, about 45 people attended the event. A summary of remarks is provided below.

SPEAKER REMARKS

5. **Mutchler**: Almost all parts of the state are aging rapidly, some faster than others. By 2030, people aged 60+ will represent ~1/3 of the population in 2/3 of Massachusetts municipalities (the exception being places with a lot of students or immigrants). This type of change has given rise to the "age friendly movement" – i.e., how do communities need to change or revisit everything they do to better align with their aging demographic? For example, when thinking about isolation and its associated health consequences, transportation becomes very important. Many communities have no local transportation options for those who can no longer drive. Massachusetts needs to improve access and usability for all modes of transportation (e.g., better sidewalks, more reserved seating on transit) for their older population.

6. **Goins**: The public health consequences of transportation decisions are significant (e.g., obesity and chronic illness). Active travel is not just about personal choice; there are also social determinants of health. For example, one's ability to walk or bike is also dependent upon political decisions to build sidewalks or bike paths. It is therefore important to engage the public health community in planning/zoning. It is also important to collaborate with the engineering community on tools to assess the health impacts of different transportation decisions. Lastly, there is an important equity consideration: a focus on walkable communities tends to increase housing costs. How do we create communities with true mode choice that remain affordable to a wide range of people?

Q&A

14. **Kadish:** What are other age-friendly recommendations you know of – either in this state or other places – that go beyond access to existing options?
Mutchler: Building new options. The majority of towns outside larger communities have no functional local transportation system. If they have services designed specifically for older adults, there are usually qualifications that have to be met (e.g.,

disability). What options are available for people who can't or don't want to drive? How do we build new options? A lot of communities are not prepared to do this without support.

15. **McGourthy:** Can you highlight the challenges to getting communities to rethink transportation? How do our recommendations have to be introduced at the local level in order to get buy in and support and a change of practice today to accomplish a change of policy for the future?

Goins: The first challenge is cost. Another is culture, including on the administration side. Transportation and public works departments have often been the sole deciders of public transportation – but it needs to be a wider conversation. The third challenge is public education. Having true mode choice and shifting a portion of the population to different modes can benefit everyone (e.g., reduced congestion and roadway fatalities).

16. **Kadish:** Are there places you think are models?

Goins: People default to the European cities. There are also communities in the US that are walkable. But they are expensive and exclusive. We should focus on communities that aren't at the top.

17. **Kadish**: Do you have any proposed first steps?

Goins: At the local level: making processes as transparent as possible. The Complete Streets program is going a long way towards changing the system. Communities that have passed Complete Streets policies are experiencing challenges of implementation. Transparency and humility are important.

18. **Sykes:** Can you speak to health disparity issues and how they're impacted by transit choices?

Goins: The health field in general is focusing more on those disparities. For our hub and spoke systems, we need to be creative about creating cross-connections (knowing the funding limitations of RTAs). How do we help people understand what is possible by walking? How can dock-less bikeshare be woven in?

PUBLIC REMARKS

14. **Mike Stanley (Transit X):** Transit X is developing a transportation network composed of "grid-separated" pods cruising above the city on suspended tracks. It will be privately-funded, solar-powered, level 6 autonomous, and overcome the costly aspects of our current transportation system.

15. **Rachael Stark (Walking in Arlington):** People are "getting over" the sprawling suburbs. By 2040, the cities and "streetcar" suburbs will be where people want to live (e.g., Malden, Medford, and Somerville). If we put things closer together, people have less need for transportation. We should prioritize walkability, moderate density, and mixed use.

16. **Howard Muise (Arlington Transportation Advisory Committee):** We need to prevent further deterioration of the transportation system in terms of travel time. If we don't address transportation problems and housing costs, the economy will not keep flourishing. Look closer at zoning laws. Increase higher density housing and accessory housing. We need to put more money into the system.

17. **Heather Hamilton (Brookline Board of Selectmen):** Brookline/Boston is developing quickly but faced with an already challenged transportation network. How can we capture some of the economic boom and transfer that into the T?

18. **Julia Wallerce (Institute for Transportation and Development Policy):** Boston is limited by our hub and spoke system, and our most vulnerable people (low-income, senior, people of color) are most dependent on transit. Right now, buses are most effectively filling this gap. We need to keep focusing on bus priority (#yearofthebus) – e.g., dedicated lanes, transit-signals, and platform boarding. Buses can also be EV and AV.

19. **Elijah Plymesser (Smart Growth America):**
    a. Prioritize multimodal infrastructure – achieving better degrees of parity between automotive and bike/pedestrian infrastructure.
    b. Take advantage of federal resources for funding – e.g., RRIF and TIFIA.
    c. Think about workforce development. How do we create a pipeline for skilled tradespeople in construction? This is related to cost overruns as well.
    d. Regarding equity, there is not a good way to travel across the Mystic River (east-west). Adding bus infrastructure along Route 16 would go a long way in connecting communities.

20. **Laura Wiener (Watertown Department of Community Development & Planning):** Culture change is a big obstacle. The aging demographic is the hardest to convince to walk or bike. We need to keep introducing vocabulary for change.

21. **Kathryn Carlson (A Better City):** We should think carefully about the implications of future technology on our end goals. For example, we could be fully autonomous by 2040. Do we want to be driven door-to-door? How does that impact obesity issues? What does that do to our streetscapes? How do we as a society want to use the future technology?

MASSACHUSETTS COMMISSION ON THE FUTURE OF TRANSPORTATION

LISTENING SESSION: CLIMATE AND RESILIENCE
JULY 10, 2018

Moderator: Steve Kadish
Commission Members: Steve Kadish, Secretary Matthew Beaton, Karen Conard, Tim McGourthy
Speakers: Paul Kirshen, Juliette Rooney-Varga, Rick Palmer

Excluding staff, commission members, and speakers, about 40 people attended the event. A summary of remarks is provided below.

SPEAKER REMARKS

1. **Rooney-Varga:** The worst case scenario for climate change predicts 8 feet of sea level rise by 2100. The Pentagon refers to climate change as a threat multiplier. I.e., as climate change increasingly causes draught and failed crops, heat stress and public health problems, damage to our built and natural environments through extreme weather – it will foster political instability. An estimated 22.5 million people have already been displaced by climate change since 2008; 500 million people believe they will be forced to leave their homes within 5 years. What can we do?
    a. Stay in the Paris Climate Accord – which will avoid 30,000 premature deaths by 2030, have $1.2 trillion dollars/year in health benefits, and create clean tech jobs.
    b. Create more meaningful policy. In transportation, we need to develop/incentivize critical infrastructure, put a price on carbon, and invest in mass transit and active transportation.

2. **Kirshen:** We need to control GHG emissions and start adapting to climate change now – and we need to think about equity as we do so. Though difficult to predict, the impact of sea level rise on the coastal road network will be significant. With 6-18 inches of sea level rise expected by 2050, we will see increases in nuisance flooding. Boston currently experiences nuisance flooding 6 days in a year; in 2060, this will be 53-365 days a year. By 2050, the "100-year flood" could be a 10-year flood. Structural damage to roads will lead to long delays. An example of an adaptive step we can take today is to strengthen the top asphalt layer and foundation of roads.

3. **Palmer:** Though climate models are not perfect, they are very helpful and getting better. When looking at hydrology and water resources, the predictions are not good. As the climate warms, more water evaporates – and since water vapor is also a GHG, a 1% increase in temperature due to CO2 comes with another 1% increase in temperature due to water vapor. This will excite the water cycle, leading to more storms and more extreme storms. 80% of models predict that we will see 2°C

(13.6°F) of warming globally by 2060, and in the Northeast by 2040. Massachusetts will have the heat and humidity of the Carolinas, and there will not be snow. We will see more flooding, endangering roads, bridges, etc. When it comes to calculating the "100 year flood," we need to be more careful. We will also see more draughts in September and October, straining our energy supply.

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Q&A

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19. **Kadish:** If you had 1 or 2 recommendations that you'd like to see the Commission make to the Governor, what would they be?

Palmer: In terms of climate, we need to look beyond 2040. We make infrastructure investments for 30-50 years.

Kirshen: 1) Control emissions. 2) Focus on equity: the transportation network is particularly important for vulnerable communities. 3) Design for the future: think of adaptation strategies that are flexible. E.g., design a bridge that can be elevated.

Rooney-Varga: The future does not look like the past – the past can no longer be a guide. With the big changes we need, the public needs to be onboard.   We therefore need to translate the science into something society can use.

20. **McGourthy:** As we talk about adaptation, in what areas do we need to restructure what we do? Are there some changes we can't fight and therefore we need to move away from?

Beaton: As soon as we complete our municipal vulnerability plan assessments across the Commonwealth, we'll have a much better understanding of how to conceptualize that.

Kirshen: In Boston, we need to think about moving away from the coast – we can't have a walled city. Coastal wetlands will continue to be endangered; if we lose them, we will lose billions of dollars in ecosystem services. How do we preserve land to help wetlands migrate inward? Additionally, we're already seeing climate refugees. People will be moving into Massachusetts, and we need to prepare for this.

Rooney-Varga: We have time to prepare for moving in a way that is ordered and fair. Additionally, we need to define what critical infrastructure is for tomorrow (beyond just protecting what is considered critical infrastructure today – much of which is outdated and fossil fuel dependent). There are many opportunities for synergies between mitigation and adaptation. Isle au Haut in Maine is developing a smart microgrid in order to be both resilient and zero-emission.

Palmer: There is still low hanging fruit. We don't need to fix everything all at once. It is important to follow an adaptive management framework over time – constantly using new data to adapt. Take the example of culverts, which blow out every year. We don't need to go through and redesign all of them at once. We should take the ones that are most likely to fail and start with those. The State has the opportunity to determine the best options holistically.

Kirshen: Stop thinking in siloes. Things can be done to protect assets of many organizations at once. This requires coordination among local agencies – including new ways of governing and financing. If every agency goes it alone, it will be too expensive.

Beaton: Governor Baker's Executive Order 569 requires all Secretariats to partner. Each Secretariat has put forward a climate change coordinator largely responsible for working with agencies to coordinate on adaptation efforts.

PUBLIC REMARKS

22. **Katherine King (MASSPIRG):** Since transportation is the largest source of GHG emissions, a cap and trade program (like RGGI) in the transportation sector is necessary to curb climate change. Following the recommendations of the Transportation and Climate Initiative (TCI), MASSPIRG recommends a descending cap on fuel importers.

23. **Frank Singleton (Weymouth Conservation Commission):** The Conservation Commission has no choice but to rely on outdated engineering standards to evaluate grant proposals. Storm water regulations need to be updated to reflected expected changes to precipitation.

24. **Ilze Greene (SolarOne Solutions):** Today's solar technology can be used for emergency situations as well as for renewable energy. E.g., incorporating off-grid solar lighting into evacuation plans. Solar lighting technology has advanced greatly and can network with wireless technology.

25. **Lloyd Mendes (Town of Somerset - SPREDD Commission):**
    a. Current Designated Port Area regulations need to be revisited to address sea level rise, and how that will change the available land and infrastructure along industrial coasts.
    b. Real estate agents are forbidden by law to share information about flood lines with homeowners. This needs to change so that people can accurately incorporate flooding into their buying decisions.

26. **Charlie Myers (Massachusetts Hydrogen Coalition):** Fuel cell technology is important for climate resilience – able to serve as an energy source for both transportation and homes. For example, Japan used fuel cell vehicles as back up energy for the grid following the Fukushima accident. Hydrogen can also be made locally using a variety of renewable resources, including wind, solar, and hydro.

27. **Joyce DiBona (WalkBoston):** Boston needs to be concerned about overbuilding – it is already "overgrown" and "over-congested." The Seaport was developed without concern for livability. Logan Airport is important for economic growth but is in danger from sea level rise.

28. **Heather Hamilton (Brookline Board of Selectmen):** CO2 does not abide by jurisdiction, but planning is often by jurisdiction. Funding is crucial for helping us plan. We need to think regionally and use organizations like the Mass Municipal Association or MEMA to bring communities together. Different disciplines also need to work together to share information – e.g., health departments, departments of public works,

etc. **Karen Conard** and **Secretary Beaton** responded with support for the Municipal Vulnerability Preparedness program in addressing some of these issues.

29. **Jordan Stutt (Acadia Center):** the Acadia Center supports a cap and invest program for the transportation sector – supported by Massachusetts' listening sessions in the fall as well as by companies like National Grid. Additionally, technology advancements have the ability to address climate issues but often do not deliver benefits equitably – we need a policy framework that takes equity into account.

30. **Andrea Langhauser (Town of Easton):** There is still low hanging fruit. There are a lot of local development regulations that the state can update. E.g., we know how to forecast a storm, but it is not in the regulations. In terms of planning, UMass has a stream continuity database – the state can use this to set goals and plans. "Tell us how you want us to grow and then give us incentives to do it." Lastly, we need to further develop water transportation.

31. **Paul Shew (PEER Consultants):** It is important to explain complicated issues in a plain way at the local level. Thank you to the panel for doing so.

32. **Jason Dvelis (Federal Highway Commission):** It is important to use concrete language that the common person can understand when it comes to climate change. People will be facing a different world, one in which their homes are not secure, and they shouldn't be caught by surprise.