

**Boulder City Council  
STUDY SESSION**

**Tuesday  
December 10, 2013**

**6-9 PM**

**State of the City  
2014 Council Reference Notebook  
Sustainability and Resiliency discussion in  
preparation for 2014 Council Retreat**

**Creekside Room  
West Senior Center  
1001 Arapahoe Avenue**

Submit Written Comments to City Council  
ATTN: Alisa Lewis, City Clerk  
1777 Broadway, 2<sup>nd</sup> Floor  
P.O. Box 791  
Boulder, CO 80306  
or Fax to 303-441-4478  
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**CITY OF BOULDER  
CITY COUNCIL STUDY SESSION**

**DECEMBER 10, 2013**

**TO:** Members of City Council

**FROM:** Jane S. Brautigam, City Manager  
Paul J. Fetherston, Deputy City Manager  
City Management Team

**DATE:** December 17, 2013

**SUBJECT:** State of the City  
2014 Council Reference Notebook  
Sustainability and Resiliency Discussion in preparation for the 2014  
Council Retreat

**I. PURPOSE**

In preparation for the 2014 Council Retreat, the December 10 study session will focus on the accomplishments and challenges of 2013, a brief and high-level overview of the 2014 Council Reference Notebook, and a sustainability and resiliency discussion.

During 2013, the City of Boulder – through the City Council, Boards and Commissions, staff and community – were able to accomplish so much and move forward a number of initiatives that are central to Boulder’s core. At the same time, the city was challenged in a way it never has been before through the September 2013 flood. The community and staff responded in the best possible way to restore core critical services in a timely fashion and to support each other in individual and collective ways. While core critical services have been restored and the assessment process continues, the recovery and rebuilding efforts will take years. The challenges, while significant, also present an opportunity for the organization and community to learn, rethink and bounce forward in a way that builds upon what has been learned and in anticipation of the future.

The recovery effort is an exciting opportunity which will take significant time and resources. As the City Council and staff look back upon what has been accomplished in 2013 and what the next council term can bring, it is important to reflect upon the

significant impact and opportunity the recovery effort and bouncing forward on staff and what is feasible from a work load perspective. The December 10 study session will help set the context for this important conversation leading into the 2014 Council Retreat, as well as the long-term resiliency discussion that will occur with the council, staff and community throughout and beyond 2014.

## **II. QUESTIONS FOR COUNCIL**

Does council have any feedback related to:

- State of the City
- Council Reference Notebook
- Resiliency planning for Boulder, especially as it relates to the 2014 work program?

## **III. DISCUSSION**

### **A. State of the City**

2013 was another great year for our community – and one in which community priorities were reinforced. With the support of City Council, funding was restored to public safety in an effort to maximize emergency preparedness; investments into Boulder’s Energy Future through the exploration of a municipal electric utility continued; steps forward in implementing the climate action plan continued; and resources to assist at-risk populations were deployed.

From the perspective of planning for the community’s future, the city also continued its development and updating of master plans, investing in technology and public infrastructure, and in maintaining a strong fiscal foundation. Forward thinking policies, combined with controlled spending, enabled General Fund reserves to increase from 10 to 15 percent – which has enabled the community to commit the funds necessary to restore and rebuild core critical services following the September flood. Continuous public outreach, along with the public’s natural engagement unique to Boulder, has kept services and facilities aligned with community priorities. The electorate’s tremendous support for November ballot initiatives will help ensure that Boulder continues its entrepreneurial approach and that the city will remain economically and socially vibrant.

The many accomplishments of the city will be reviewed through a video that will be viewed at the start of the study session and which will be aired on Channel 8 and available through the city’s social media outlets.

### **B. 2014 Council Reference Notebook**

In support of the community and organization’s commitment to sustainability, this marks the first year that the Council Reference Notebook is an electronic resource. Through the link listed below, council and the public can access the following resources:

- Department and Division Profiles: which outline each respective Department/Division mission, structure, responsibilities, links, and staff contact information.
- Major Projects: This section outlines the major citywide projects that have been and will continue to progress; and that are anticipated to move forward in 2014.
- 2013 Accomplishments: By late December, a compilation of organizational accomplishments – listed by council goal – will be uploaded and available through the Council Reference Notebook.

One of the benefits of an electronic Council Reference Notebook is that the information will be updated and accessible throughout the year. Council and the public will be able to access the Department Profile pages and Major Project pages throughout the year and receive up-to-date information on the status of a particular item. In addition, an archived electronic file of the Council Reference Notebook reflective of the date it is distributed will be accessible to the council and public for historic purposes.

The December 10 discussion of the Council Reference Notebook will focus on a high-level overview of the information provided. As the council moves towards the 2014 Retreat during which it will focus on its collective high-level vision for the community, the information is intended to help provide context. In doing so, it is critically important to relate the accomplishments, major projects, vision and challenges and opportunities presented by the community's long-term resiliency efforts together. By recognizing the interrelatedness of each of these, the council can develop a vision that honors the community's past, present and future which is sustainable, achievable and appropriate for the resources available.

## **2014 Council Reference Notebook**

[bouldercolorado.gov/city-council/2014-city-council-reference-notebook](http://bouldercolorado.gov/city-council/2014-city-council-reference-notebook)

### **C. SUSTAINABILITY AND RESILIENCY**

#### **Bouncing Forward – Long-term Community Resilience**

#### **Game Changers of 2013**

Several events and developments of 2013 were, in many respects, “game changers” for Boulder. Three of them are described below.

##### *The Thousand Year Rain*

The “1000-year rain event” of early September was significant not only in the intensity and duration of the rain that fell, but also in the extensive geographic area over which it fell. Rainfall upstream of the city contributed to varying intensities of flooding along Boulder Creek and its 14 tributaries while rainfall within the city contributed to countless localized issues. While areas previously identified as prone to creek flooding were most impacted, the sheer volume of rain also caused water to enter hundreds of structures across the city – and put an unprecedented strain (in total volume and extent) on the city's infrastructure systems. Put simply, the city simultaneously experienced multiple anticipated flood events that combined into one less probable, more disastrous, and

unanticipated flood event. It was an unanticipated extreme weather event that put in motion both expected and unexpected flood consequences.

Whether one attributes the circumstances of this particular extreme weather event to climate change, or believe that it was just a highly unusual weather pattern, several things are clear: it was extreme, it was abnormal in terms of the flood events we have traditionally anticipated, and it was a natural disaster of unprecedented scope and scale in how it impacted people and property throughout the region. The answer regarding whether or not it was spurred or worsened by climate change is most pertinent in terms of looking forward: will events of this scope and scale increasingly become “the norm” rather than a millennial aberration?

### *The Utility of the Future*

One of the most significant work efforts undertaken in 2013 focused on the analysis of alternatives for creating a locally owned and operated electric utility. While this effort is driven by multiple objectives, key among them is the opportunity to invest in a cleaner energy portfolio focused on renewables, carbon reduction and localized, distributed generation. This analysis – and the subsequent “third-party review” which verified its results – demonstrated that a significant shift in energy supply is not only possible, but also has economic value in addition to environmental benefits. In other words, it could not only significantly mitigate local greenhouse gas emissions, it could significantly contribute to long-term community resiliency in the face of future energy crises and a shifting economy. The 2013 analyses, coupled with the November 2013 vote in which a clear majority sanctioned moving forward with continued exploration of municipalization, represent a potential “game changer” in the momentum they have created toward transforming one of the community’s most fundamental services. This initiative will continue to be a major work effort and a critical opportunity to position Boulder as an innovation center in creating “the utility of the future” and catalyzing a low-carbon economy.

### *“Unequivocal” Climate Change*

The international scientific consensus on the trajectory and consequences of human-caused climate change – and the necessity of immediate action to substantially reduce greenhouse gas emissions while simultaneously preparing for the impact of climate shifts already set in motion – found clear and compelling voice in 2013 with the release of the latest report from the Intergovernmental Panel on Climate Change. The report was the most strongly worded yet, stating that evidence of global warming is unequivocal, and that it is “extremely likely” that human activity has been the dominant cause of the observed warming trend.

In 2013, Boulder reaffirmed its commitment to reducing local greenhouse gas emissions in keeping with science-based global targets necessary to avoid the direst global warming projections. Council agreed in principle to the long-term goal of an 80 percent reduction in emissions by 2050, and staff has been working to develop appropriate strategies for near-term steps in key emission categories (as well as new data tracking tools) while continuing to implement proven strategies in areas such as energy efficiency. Success in

achieving significant reductions in city facilities and operations have been encouraging, in addition to continued market penetration of EnergySmart services and adoption of new efficiency requirements in the city's building code. However, significant reductions must be achieved in the coming years if the ultimate goal is to be realized. Shifting the community's energy supply source is key. As our understanding of these issues continues to evolve, we increasingly recognize that achieving these goals serves not only global climate concerns but becomes the foundation and impetus for an innovation oriented economic development strategy.

### **Facing an Uncertain Future**

These game changers underscore key themes of change and uncertainty. These are not new themes; Boulder has faced change and uncertainty with regularity since its founding. But in terms of scope, scale and urgency the current set of challenges can seem daunting.

Localized projections of climate change impacts include decreased snow pack, increased wildfire, and increased frequency of severe weather events. Whether or not the September 2013 rains were directly attributable to climate change, they illustrated the challenges of an uncertain climate future.

As an example of how climate uncertainty might shape future work efforts, consider this: While the Boulder region received approximately 85 percent of its annual average precipitation in the span of those few days, the location and timing of the event resulted in no significant addition to the city's water supply system, which is designed to capture melting spring snow from the mountains, not large volumes of rain within the city itself. If snow packs diminish over time, and such rain events become more common, this shift in patterns could represent a significant challenge to future water security (not just in Boulder, but in the region).

Uncertainty has many sources, not just from climate change. Consider the ways in which national and global economic events can impact local businesses, households and city revenues, as illustrated in the recent Great Recession. While Boulder was largely spared the worst impacts, it is easy to imagine a different set of circumstances that could have resulted in much more significant and widespread disruptions. Or consider how fluctuating global energy prices could impact economic activity, transportation and food costs.

Exposure to uncertainty is a part of life; there is little that can be done to reduce uncertainty. However, there is a lot that can be done to anticipate potential consequences, reduce the impact of unexpected events and be in a position to "bounce back" when bad things happen. These ideas are at the core of mitigation and resiliency planning.

### **Recovery and Resiliency**

Since September 2013, the city has been addressing immediate recovery needs to repair infrastructure, provide assistance, and formulate partnerships and set out a path for long-term recovery.

**Long-term Community Recovery** is the process of establishing a community-based, post-disaster vision and is focused on plans and projects *to address damages sustained from the flood* and to aid in the community's recovery from the disaster. Existing plans, policies, and studies must be reviewed and considered as part of the long-term recovery process. By applying both the city's sustainability framework and resilience principles, we can maximize the ability of the long-term recovery plan to enable the community to respond and adapt effectively to future challenges.

**Resilience** is defined as *“the ability of a system, entity, community or person to withstand shocks while still maintaining its essential functions. Resilience also refers to the ability to recover quickly and effectively from catastrophe and the capacity to endure greater stress.”* (Rockefeller Foundation, 100 Resilient Cities, 2013). The “Briefing Paper on Resilience Concepts and Applications” that accompanies this memo provides an overview of current thinking on resiliency and provides a list of helpful and relevant resources. The intent is to help us think about what resiliency means for Boulder.

Resiliency looks at the long term and is about being prepared for many types of unforeseen events – social, physical, and economic. Boulder has a strong history of resiliency planning, even if the term itself has not often been used. Examples include: floodway planning that has worked to remove structures in high-hazard zones, utility planning that has ensured redundant systems, financial planning that has ensured diverse revenue sources, the robust social services network developed collaboratively with various partner agencies, intergovernmental land use planning to identify appropriate areas for development and promote the orderly annexation and provision of municipal services as properties urbanize. The city has worked to create systems that are not only economically, environmentally and socially sustainable, but which can also survive shocks and quickly adapt to changing circumstances. The concept of resiliency for Boulder is an evolution of thinking, not a revolutionary new approach. Much about how Boulder provides services, builds infrastructure, and plans for the future should remain rock solid, even as the community and city explores how both current thinking and recent events might alter and strengthen our path forward. In addition, the Rockefeller Foundation just awarded Boulder membership into the “100 Resilient Cities” - making us one of the first 33 cities of what will eventually be a network of 100 honored and supported to develop and apply new and emerging ideas and tools. The grant will help Boulder prepare a resiliency plan to respond to the anticipated shocks and stresses identified above, such as climate change or public health threats. Support will include hiring a new staff position to oversee the development of a plan that fits Boulder's distinct needs and allow the city to be part of a learning network. The city will also have access to a platform of tools and resources for implementation of the plan focused on four areas: (1) innovative finance, (2) innovative technology, (3) infrastructure and land use, and (4) community and social resilience.

As the city works to rebuild and recover from the 2013 floods, the principles of resiliency planning will guide work efforts and investments, both in the specific long term recovery process for the flood, as well as the broad resiliency planning efforts supported by the

Rockefeller Foundation grant. Both efforts have distinct and unique outcomes, and both will inform each other, the community, and the city organization about the long view of being a sustainable and resilient community. These efforts will highlight new priorities for capital infrastructure, enable us to have a greater community understanding of risks and hazards, and will inform policies in the Comprehensive Plan and Master Plans. They will also help identify sectors and circumstances that require broader collaboration with other agencies, municipalities and stakeholders.

### **Bouncing Forward in 2014**

For the December 3 City Council meeting, staff began to identify some of the lessons learned from the 2013 flood events. In looking ahead to the work of 2014 and beyond, the city has the opportunity to not only plan for long-term recovery so that we “bounce back” from the flood and are prepared for the next emergency event, but to also “bounce forward.” In other words: approach our work in a way that improves long-term resiliency *and* positions our community for long-term success despite the many uncertainties we may face.

Taking a few of the lessons learned in 2013 to illustrate how they might represent opportunities to not just bounce back, but bounce forward, some thoughts are provided below, each in response to a key lesson learned.

#### ***Key Lesson: Fit the process to the problem.***

During and after the flood, decisions were made and actions taken in a timely manner. Aided by clarity regarding the outcomes needed, streamlined processes were quickly put into place. Other “non-traditional” process examples in 2013 also stand out: creating short-term ad hoc working groups to assist with specific aspects of the municipalization analyses; partnering with artists, using online tools like InspireBoulder, involving youth and others in the Civic Area visioning events; and bringing in key stakeholders for concentrated input at key points in the Parks and Recreation Master Plan update. Being nimble, thinking carefully about when input is needed, being creative in reaching out to “the uninformed,” creating “one stop shops,” with multiple departments present with information, such as with the recent flood open houses, and avoiding reliance on a “standard” process are key lessons from 2013. *How can work efforts in 2014 use these lessons to ensure meaningful opportunities for community input and deliberation while avoiding process fatigue?*

#### ***Key Lesson: Don't let the perfect be the enemy of the good.***

Emergency events require acting on the best information available, drawing on experience and instinct, and trying higher level policy ideas at a small scale on the ground to see if they work before implementing more widely. There is trial and error, and learning-on-the-fly. “Analysis paralysis” is not an option. Boulder has applied these lessons before (e.g., trying small scale pilots to test transportation innovations and policy) and during the floods relied on well trained, highly qualified staff to take reasonable risks in solving problems on the fly. *Where and how might it be appropriate in 2014 to “pilot” new initiatives even if we don't have all the answers, to take reasonable risks, or to move*

*forward with a policy or program knowing that it may not be perfect but that it's in the right direction and we can make it better over time?*

***Key Lesson: The city doesn't need to do it all or go it alone.***

The flood response illustrated the power of partnership and the value of the city playing its role while allowing or relying on others to play theirs. The Emergency Operations Center is an excellent example of partnership in action. Created through collaborative planning, investment and training, it exemplifies the synergies that can be realized through working together rather than working apart. Other examples include the regional collaboration around the creation of managed lanes and BRT operations on Highway 36, the city's ongoing partnership with the Boulder Economic Council on business outreach, and the countywide partnerships for human services delivery that enabled the Disaster Assistance Center to be up and running in just a few days, and are continuing to play a key role in longer term flood recovery and assistance efforts. *How can the city best continue to forge and sustain meaningful partnerships in 2014 and beyond that leverage community resources, focus on shared priorities, and position the city to do what it does best while relying on others to do what they are best at? Which relationships or partnership opportunities require our strategic attention? What aspects of resilience capacity building can or must be done with the city and which require a larger regional multi-institutional approach?*

***Key Lesson: Resiliency is not just physical, it's social.***

When talk turns to resiliency planning in relation to the flood events, many people think immediately of physical systems: how to create resilient floodways, utilities and transport systems that can survive the shock of a major storm. But the 2013 floods also highlighted the critical nature of social resiliency: neighbors helping neighbors; human services systems; faith-based organizations – individuals and groups that reached out and helped those most impacted survive and recover from the shocks of property loss, displacement and emotional and financial stress. These systems work best when relationships (and trust) have been forged over time and ways of working together developed and tested. *How can the city best develop and sustain the necessary social infrastructure and trusted relationships needed to support community resiliency in a time of change and uncertainty? How do we make sure that those most vulnerable, and most impacted, are supported to not just bounce back, but bounce forward?*

***Key Lesson: The value of volunteerism***

In the weeks following the floods, large numbers of volunteers from throughout the city and region pitched in to help with clean up efforts, trail and park restoration and disaster assistance. The support provided was invaluable, and those who volunteered expressed their satisfaction in being able to help out. Volunteers help provide valued support in a range of city services, from ongoing support in open space, parks and recreation, and other areas. They also contribute by serving on city boards and commissions, and lending expertise to community working groups in specialized areas. Volunteering is also valuable in connecting people to their community, and to each other, contributing to social resiliency. *How can the city best continue to tap into volunteerism to deliver valued community services, inform decision making, leverage resources and expertise,*

*and build social resiliency? What is the best way to coordinate and enhance volunteer efforts, and ensure that volunteers' time and effort is adequately utilized and appropriately recognized?*

**Key Lesson: Maintain and enhance what is “rock solid”**

Boulder has a strong history of planning for the future and designing for resiliency. The places the city fared well during the flood were the result of years and years of persistent investment in improvements. *How can the city ensure we build on what has been successful and continue to take the long view and practices that have served the community well? What is the best way to evolve our current processes to incorporate resiliency planning without just adding additional efforts to current efforts, for example incorporating resilience principles as part of the 2015 comprehensive plan update?*

**Integrated Systems Thinking: Enhancing Sustainability**

Sustainability has been an overarching goal driving city policies and actions for more than a decade. For the past two years, city staff has been working to develop and apply a “sustainability framework” to promote the integration of sustainability principles in master planning processes. Council has seen and been supportive of evolving iterations of the framework in the Fire Rescue Master Plan, Police Master Plan, and Parks and Recreation Master Plan.

The purpose of the framework is to encourage holistic, systemic thinking and support more strategic decision-making through the alignment of priorities and a focus on shared outcomes. Resiliency planning – building the adaptive capacities to withstand and recover quickly from shocks and stresses – enhances our ability to achieve sustainability goals in changing environments where the future is unpredictable.

Used in combination with principles of resiliency planning, the sustainability framework helps promotes an integrated approach to policy and program development that considers how individual initiatives help to advance multiple sustainability objectives, as well as how multiple initiatives help to advance specific sustainability outcomes. This helps to compel collaborative approaches to achieve multiple and shared goals or outcomes, instead of more “siloes” approaches. The latest evolution of Boulder’s Sustainability Framework is provided in **Attachment B**.

**Living the city’s Vision and Values**

Finally, over the past two years the city organization has spent time developing and refining a statement regarding the organization’s vision and values. These focus “how” we work with and on behalf of the community we serve and are highly relevant as we look to the work of 2014 and beyond. As Boulder works to develop a resiliency plan, it will be done in a manner that reflects the city’s values with a focus on collaboration, innovation, and customer service.

<p style="text-align: center;"><b>City of Boulder Vision and Values</b></p> <p><b>Vision:</b> <i>Service excellence for an inspired future.</i></p> <p><b>Values:</b></p> <ul style="list-style-type: none"><li>• Customer Services</li><li>• Respect</li><li>• Integrity</li><li>• Collaboration</li><li>• Innovation</li></ul>
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## **Looking to 2014**

As council looks to its January 2014 retreat, it is important to reflect on the lessons learned from 2013 and how those lessons might inform the city's work program priorities in 2014 and beyond. It is essential to develop a shared understanding and vision of what we are trying to achieve – not just in terms of flood recovery and specific priority outcomes, but perhaps most importantly in terms of how we best support the long-term resiliency and sustainability of our community in the face of both uncertainty and unprecedented opportunity.

Next steps include working with the Rockefeller Foundation, 100 Resilient Cities grant, to organize a resiliency workshop in January or February 2014 to begin a community conversation about what resiliency means for Boulder, and what issues and strategies a plan should address. The city will also begin the discussion about hiring a Chief Resiliency Officer within the organization, funded through the 100 Resilient Cities grant. The officer's role will be to engage critical stakeholders and incorporate their views and needs, particularly vulnerable populations, in the development of a Resiliency Plan.

## **IV. NEXT STEPS**

The feedback provided by council will help influence the 2014 Council Retreat as well as the on-going efforts related to the September flood recovery and long term community resilience.

## **ATTACHMENTS**

- A. Briefing Paper on Resilience Concepts and Applications
- B. Sustainability Framework

# **Briefing Paper on Resilience Concepts and Applications**

**Prepared by the Department of Community Planning and Sustainability  
City of Boulder  
December 2013**

Over the past decade, the increasing incidence of large-scale disasters and the growing evidence of climate change impacts have focused attention on ways to reduce community risks and increase capacity to respond effectively to unavoidable disruptive events. The

term “resilience” has emerged as one of the most frequently used concepts for the range of strategies and actions that individuals, communities, and governments are taking to reduce vulnerabilities and increase adaptive capacities.

This paper provides an overview of the various ways resilience is being defined and applied in the context of community preparedness for disruptive events. Key themes and considerations are identified including the relationship of traditional risk management to resilience capacity building, as well as two frameworks for assessment of community resilience. The paper also includes links to recommended readings for further background on resilience, examples of policy documents developed to guide resilience planning and implementation in post Hurricane Sandy efforts, and a short case study of a community that has successfully implemented significant resilience capacity building initiatives.

### **What is Resilience?**

One of the most frequently referenced definitions was developed by the Resilience Alliance (<http://www.resalliance.org/>), a non-profit research organization formed in 1999 by researchers, universities, governments and non-governmental organizations to develop a clearer understanding and application of resilience concepts. The Alliance’s definition for resilience is:

*“The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure and feedbacks - and therefore the same identity.”*

Resilience has subsequently been widely applied in social, economic, and political settings in terms of civil response to terrorist attacks. After the 9/11 bombings and the formation of the Department of Homeland Security (DHS), a substantial body of research and academic analysis was directed to the topic of resilience. As part of its findings, the DHS developed its own definition of resilience:

*“Resilience is the ability of systems, infrastructures, government, business, and citizenry to resist, absorb, and recover from or adapt to any adverse occurrence that may cause harm, destruction, or loss [that is] of national significance.”*

In an interesting variation on this definition, a Homeland Security Advisory Council created its own resilience definition that adds the recognition that disruptive events can lead to permanent changes in systems to which subsequent social systems must then adapt:

*“Resiliency is defined as the capability of a system to maintain its functions and structure in the face of internal and external change and to degrade gracefully when it must.”*

ResilientCity.org, an online network of planning and design professionals focused on the topic of resilience, proposes a definition specifically for cities that builds on the Resilience Alliance definition above:

*“A Resilient City is one that has developed capacities to help absorb future shocks and stresses to its social, economic and environmental systems and infrastructures so as to still be able to maintain essentially the same functions, structures, systems and identity.”*

### **Key Themes in Resilience**

Across these and similar resilience definitions, here are a number of common themes. These include:

Resilience is not the same as “resistance”— An important concept in the resilience literature is the recognition that systems – whether ecological, social or other – will generally attempt to resist disruptive change or events. These systems – preexisting patterns of relationships, resource distribution, social behavior – will attempt to resist disruptive forces in much the same way a body will attempt to resist illness. If a system is durable, well resourced and dynamic, it may be able to “resist” major disruptions – e.g. minimize flood damage; control wildfire before it creates significant damage; change to a different primary energy or resource – before a system disruption threshold takes place.

Resilience addresses system disruption — Resilience becomes a key consideration when a system/community’s attempt to resist a disruptive disturbance fails and that impact begins to alter the basic function of that system. The characteristics of that disturbance (intensity, duration, surprise) all impact the resilience capacity of a system/community. As resilience researcher Patricia H. Longstaff notes: *“Crisis occurs when a surprise reveals an unambiguous failure of the rules, norms, behavior or infrastructure used to handle that type of surprise.”*

Resilience includes but is broader than climate change adaptation — Resilience is about building capacity to respond to a wide range of system disrupting events – ecological (e.g. flood, fire, tornado), economic (e.g. economic collapse, resource shortage), and social (e.g. terrorist attack, social unrest etc). In many cases resilience building efforts such as social network development or rapid response systems will augment resilience against a range of different types of disruptions.

Recovery capability: “bouncing back” — Central to the concept of resilience is the ability of a system to regain its equilibrium and restore all of its basic functions within a relatively short period of time. This is sometimes referred to as “bouncing back.” Researchers have noted an important distinction in the recovery process between “engineering” resilience and “ecological” resilience. Engineered resilience attempts to return systems back to their original pre-designed state. Ecological resilience accepts the possibility that the restored condition may be changed in ways necessary to adapt to new conditions. This is sometimes referred to as a “new normal.”

Recovery with redesign: “bouncing forward” — These common themes suggest the importance of broadening the view of resilience to consider how disruptive events may serve as opportunities to reorganize and rebuild systems in ways that make them more adaptive and more productive in a new setting of more frequent system stressing

events. The Urban Land Institute's [recent report](#) on the Hurricane Sandy response efforts models this new approach to resilience in its proposed definition for resilience:

*“Resilience is the ability not only to bounce back after a disruptive event but to ‘bounce forward’ – to recover and at the same time to enhance the capacities of the community or organization to better withstand future stresses.” These enhanced response capacities may also serve to orient social, financial and infrastructural assets in ways that enhance long-term community livability and financial vitality,*

Resilience enhances sustainability — As noted in the memo, resilience is about systems thinking and building adaptive capacities to withstand and recover from events quickly. The literature notes it enhances and complements the concept of sustainability. In Boulder's case, it fits very well with the sustainability framework already being addressed through master plans.

### **Resilience and Risk**

For decades, the public and private sectors and individuals have been engaged in resilience planning. The well-developed field of risk management, for example, is a set of principles and procedures for identifying, quantifying and “mitigating” risk in ways that can enhance community resilience. “Risk” in this sense is the potential for disruptive events. The more likely that potential disruption is to altering individual or collective systems, the more it becomes relevant to resilience planning. Consequently, risk management activities have focused on actions that can reduce the likelihood or severity of such events. In this way, risk management and resilience capacity building can be mutually reinforcing.

Over the years Boulder has undertaken risk management and resilience planning in response to threat of flood, drought and other natural disasters. Perhaps the most visible example is the city's greenways system, developed over a number of decades not only to provide an off-street pedestrian and bicycle transportation and recreation network, but also to mitigate flood hazard in the city's drainageways. Another example is the city's Multi-Hazard Mitigation Plan, updated and approved by City Council in April 2013, addressing the risks of numerous natural and human health hazards. Additionally, the drought of 2002 fundamentally altered the way Public Works Utilities operates and the community uses water, including water budgeting, increased outreach, significant customer behavior change and improved drought planning techniques.

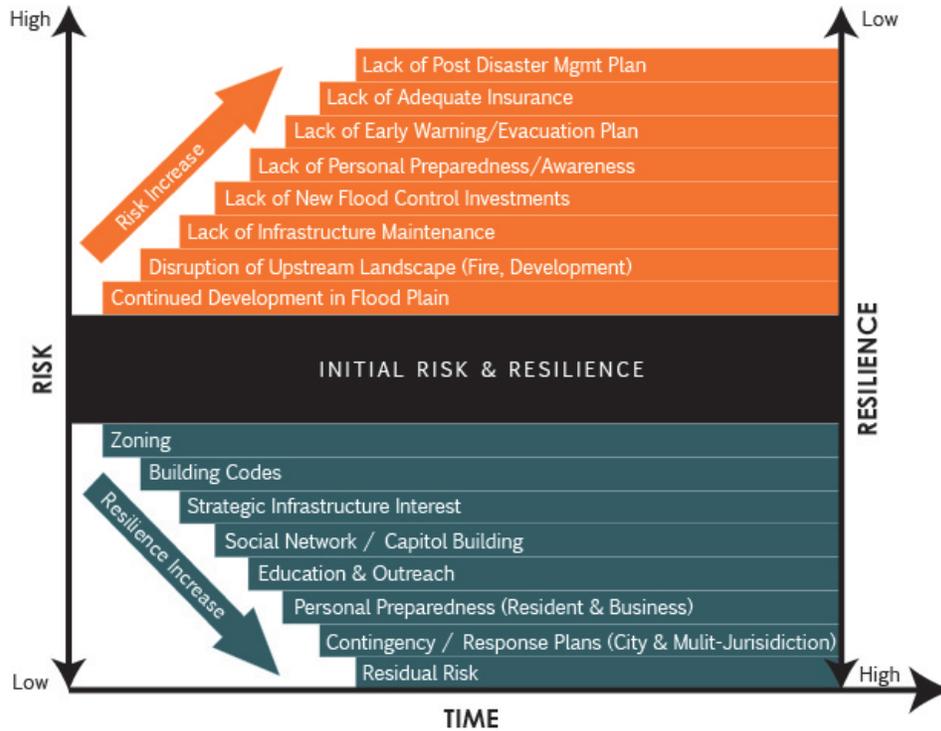
Risk (& Resilience) Multipliers — An important phenomenon in risk analysis that can also be applied to resilience capacity building is the potential for “risk multipliers.” These are actions or conditions that can make a crisis far worse than it would be if this condition or dynamic was not influencing the event.

Figure 1 shows the concept of a risk multiplier in the context of flood hazards. The center of the graph shows an initial risk condition, in this case a risk of flood damage. The left vertical axis represents flood risk from low at the bottom to high at the top. The horizontal bars above this initial risk condition represent risk multipliers –

actions/inactions or conditions that each aggregate with other factors to increase the total risk of a flood event.

In a similar way but in reverse, the right vertical axis represents resilience to flood impacts, ranging from low resilience at the top to high resilience at the bottom. The horizontal bars below the initial risk condition represent the steps a community can take to reduce its risk and simultaneously increase its resilience to an event should it happen.

**Figure 1 – Risk & Resilience Factors**



(Source: This figure is adapted from a presentation by Edward A. Thomas, President of the Natural hazard Mitigation Association titled *“Building Community Resilience through Hazard Mitigation and Climate Adaptation.”* <http://www.climate-adaptation-symposium.org/recordings/2013-06-10-1130-Thomas.mp4>)

An important dynamic illustrated by this graphic is the way public and private actions can be mutually reinforcing – either enhancing risk or increasing resilience. This underscores the critical role of broad multi-sector multi-level learning, information sharing and coordinated action.

Resilience and Risk Management, Distinctions — With the substantial similarities between resilience planning and risk management, some may question whether resilience is anything more than a new term for a pre-existing practice with long history and practical experience. Although still emerging in practice, the following features of resilience planning may not typically be integrated into risk management approaches.

- *Whole systems versus sector focused effort* — Often risk management is practiced in specific and sometimes highly differentiated ways. For example, risk management efforts related to flood hazards would not necessarily consider how their measures also addressed risks faced by vulnerable populations to economic disruptions. Resilience planning attempts to create a comprehensive framework that recognizes and integrates critical capacity building in ways that address hazards across a broad range of risks.
- *Dynamic response systems* — Many risk response systems utilize highly structured and vertically hierarchical incident command systems. While highly effective in many settings, these relatively rigid organizational structures are frequently challenged by events that are highly complex and rapidly changing. Even in the military context where incident command is widely used, new battlefield management systems rely on complimentary systems of highly responsive, horizontally networked information and response systems. Building these sorts of dynamic response systems is a key attribute of highly resilient systems.
- *Integrated learning* — Closely related to these two previous distinctions is another core principle of resiliency: whole systems learning. Risk management has become a highly specialized profession which can sometimes result in risk response being dependent on experts or specialists. In highly resilient systems, there are mechanisms for both pre and post disruption learning to prepare and empower the entire effected system to have the knowledge, tools and information, needed to respond effectively when disruptions occur.
- *Safe failure* — Though sometimes included in risk management analysis, a key consideration in resilience planning is the preparation for systems failing and attempting to build in “soft landings” so that those failures do not take down larger portions of the overall social, economic or ecological systems.

### **Resilience Frameworks**

While a growing number of academic and professional papers discuss the topic of resilience, few propose frameworks for how to assess and monitor community resilience. One of the most widely cited is a 2010 paper by the pioneering resilience analyst Patricia H. Longstaff and colleagues titled [“Building Resilient Communities: a Preliminary Framework for Assessment.”](#) This paper is probably the single most comprehensive overview of both resilience and an effort to provide a practical framework for its implementation. In Longstaff’s framework there are five key community subsystems:

ecological, physical infrastructure, economic, governance, and civil society. Each is described briefly below.

1-Ecological Systems — These are the basic biological and physical aspects of the natural environment in which a community is located. Some aspects of these systems are within the capacity of human influence and control (types and locations of vegetation, landform) and some are not (geology, climate, subsurface hydrological systems).

2-Economic Systems — The forms of economic exchange taking place within and around the community. A critical factor in creating resilience is understanding the core elements of this system that could be impacted by a range of different disruptive events e.g. food systems, access to capital and credit, security.

3-Physical Infrastructure —The hard systems (roads, buildings, water systems, sewers) as well as telecommunications infrastructures, power plants and other elements that may not be within the immediate boundaries of the community.

4-Governance — The public organizations (political, administrative, legislative, and judicial institutions) that contribute to the function of community governance.

5-Civil Society — The critical sphere of non-governmental organizations, both the more formal associations like social service organizations and churches, and the more informal associations between interest and affinity groups.

Each of these five key community systems is further defined by the two concepts: “resource robustness” and “adaptive capacity,” described below and shown in the figure to the right.

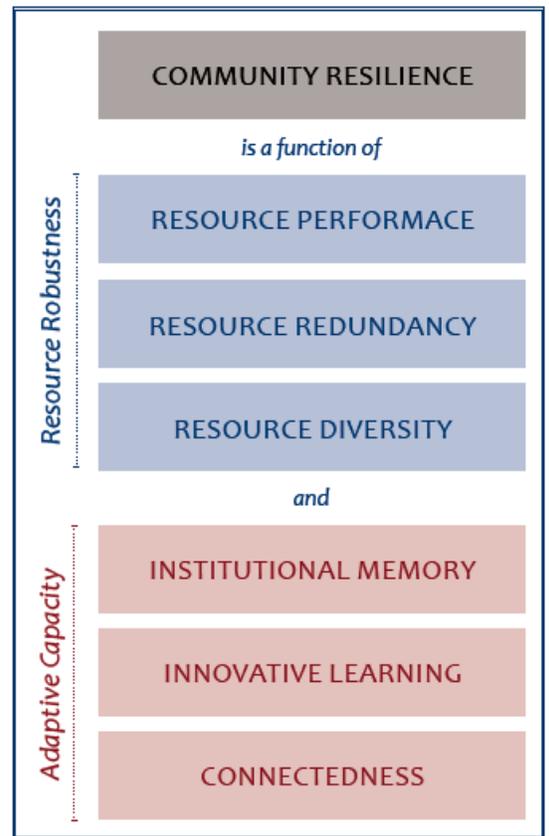
Resource Robustness — Three key attributes of resources utilized by a community to respond to crisis are:

1. *Performance* — This is a combination of the quantity and the quality of available resources.
2. *Diversity* — The more different types of resources a community has access to, the more creative it can be in its response to disruptions.
3. *Redundancy* — The ability to provide back-ups to key resources or processes is a key issue in maintaining basic levels of system functions during a crisis.

Adaptive Capacity — A community’s adaptive capacity is assessed based on its level of the following:

1. *Institutional memory* — The ability to gather, codify and learn from experiences in ways that enable the community to effectively adapt to new circumstances or disruptive events.

Figure 2: Community Resilience, from Longstaff 2010 paper



2. *Innovative Learning* — The ability to use available resources and information to try new approaches or respond quickly and creatively to unforeseen events.
3. *Connectedness* — The level of information exchange and coordination that takes place within a community both formally (vertically) and informally (horizontally) and particularly how effectively these systems function during a crisis.

A similar but much less extensive [resilience assessment scorecard and toolkit](#) has been developed by the Torrens Resilience Institute in Australia. It utilizes four primary community attributes – Connectedness, Risk/Vulnerability, Procedures, and Resources – as the areas for analysis. The kit provides a set of questions and a scoring system for each that can then be summarized and compared to a scoring guide to provide a community a very simple first assessment of its resilience capacity.

### **Considerations**

Throughout the literature and case studies on resilience, a number of key considerations emerge that can help inform Boulder’s work to further integrate resilience concepts into community and individual actions.

1. Surprise is inevitable

Boulder has previously experienced disruptive events, and will continue to face them into the future. Continued work is needed to build community and organizational capacity to rapidly adapt to the unexpected as well as to prepare to the extent possible for what can be anticipated. Response plans must include clear procedures for what can be expected (water system failure, electrical blackout, etc.) and also forms of organization that enable highly networked data gathering, assessment and response planning for those situations that can’t be anticipated.

2. Shared learning

All analyses on resilience emphasize the enormous importance of creating extensive learning capabilities within organizations, between organizations, and across a larger social system or community. This shared learning capability is one of the most important resilience capacities for communities.

3. Shared risk management

One of the important benefits to broad and inclusive shared learning is the opportunity to develop greater awareness and shared understanding about the different roles, responsibilities and capacity limits that each of the different aspects of a community holds. If residents continue to see crisis response as primarily the role and responsibility of public agencies and governments, they may abdicate or overlook critical actions that must be taken at the individual and social group levels to build adaptive capacity to respond to disruptive events. In some cases, these personal actions could, in aggregate, have a larger impact on a community’s resilience capacities to some types of events than all of the combined investments possible by public sector entities.

#### 4. Resilience depends on effective preparation

As part of this larger awareness of shared roles and responsibilities, resilient communities are proactive in developing response plans for each separate entity and in coordination with each other across sectors and scales. One of the critical areas of preparation that is often not recognized until too late is the need for systems to manage disaster response resources after a disruptive event has taken place. In a recent presentation on “Planning for Post Disaster Recovery,” disaster specialist Gavin Smith from the University of North Carolina described the common experience of many communities in being overwhelmed by the complexity and rigid procedures stipulated by FEMA and other disaster relief sources. Boulder’s own recent experience in the flood has underscored the importance of pre-disaster planning to insure that recovery actions that are most strategically important for “bouncing forward” have the necessary planning elements in place to comply with the funding requirements and timelines stipulated by FEMA and other funding sources. As part of the lessons learned from the flood, the city is participating in a larger County wide Long-term Flood Recovery Group that is looking at both issues of recovery from this flood and preparations for future flood events.

#### 5. Application for cities

An excellent overview of public sector policy recommendations to enhance local and regional resilience is outlined in the recent Urban Land Institute’s “After Sandy: Advancing Strategies for Long-term Resilience and Adaptability,” listed in the readings below.

#### **Summary**

Resilience is a relatively new concept and planning framework for public and private sector planning and implementation initiatives. While potentially broadly inclusive of many factors, there is an increasingly precise meaning for this term as a description of how systems can prepare for and respond to disruptive change. Given the increasing frequency and intensity of these types of system disruptions – both through forces like climate change and more socially-derived factors like economic crisis or terrorism – resilience is a potentially critical consideration in all aspects of public and private planning, resource deployment, and social connectivity. Boulder has a unique opportunity to participate directly in the refinement and application of resilience principles as part of its own critical considerations related to flood and other disaster recovery issues as well as a first tier cohort in the international 100 Resilient Cities initiative sponsored by the Rockefeller Foundation. This is a dialogue and learning process that needs to include a broad cross section of the community – socially, institutionally, and economically. Effectively integrating these concepts and approaches can further enhance both Boulder’s ability to effectively respond to the inevitable future disruptive events and serve as a way to improve the larger social, economic and environmental qualities of our community and our region.

#### **Resilience Readings and Websites**

The following website links provide information and perspective on resilience concepts and application:

**“10 Essentials for Making Cities Resilient.”**

<http://www.unisdr.org/campaign/resilientcities/toolkit/essentials>, and

**“A Handbook for Local Government Leaders” 2012:**

<http://www.unisdr.org/campaign/resilientcities/toolkit/handbook>

on United Nations Office for Disaster Risk Reduction (UNISDR) website “Making Cities Resilient”

**100 Resilient Cities, Pioneered by the Rockefeller Foundation**

<http://100resilientcities.rockefellerfoundation.org/resilience>

*The website contains definitions and resilience resources for cities.*

**“After Sandy: Advancing Strategies for Long-term Resilience and Adaptability.”**

Urban Lands Institute. Washington, DC: Urban Lands Institute 2013.

<http://www.uli.org/wp-content/uploads/ULI-Documents/AfterSandy.pdf>

*This is an overview of public sector policy considerations to enhance local and regional resilience. A 25-person multi-disciplinary panel of disaster response specialists outlined 23 specific recommendations across four themes: land use and development; infrastructure, technology and capacity; finance investment and insurance; and leadership and governance. While focused on the Hurricane Sandy recovery context, many are equally relevant to Boulder and the Front Range.*

**"Building a Financially Resilient Government through Long-Term Financial Planning."** The Government Financial Officers Association.

<http://gfoa.org/downloads/GFOABuildingFinanciallyResilientGovernment.pdf>

*This article explores the eight essential characteristics of a resilient system as they relate to creating a financially resilient government and the central role that long-term financial planning plays in financial resiliency.*

**“Building Resilient Communities: A Preliminary Framework for Assessment.”**

P.H. Longstaff, et al. *Homeland Security Affairs*, Vol. VI, No 3: Sept 2010.

<http://insct.syr.edu/wp-content/uploads/2012/09/Building-Resilient-Communities.pdf>

*Patricia H. Longstaff is one of the leading thinkers in the emerging literature on applying resilience to human society. This paper provides an extensive overview of the assessment framework summarized in this paper.*

**“Developing a Model and Tool to Measure Community Disaster Resilience:**

**Community Disaster Resilience Scorecard Toolkit.”** Torrens Resilience Institute,

October 2012. <http://torrensresilience.org/images/pdfs/toolkit/tritoolkit.pdf>

*This is an Australian model and tool for community disaster resilience.*

**“Disaster Resilience: A National Imperative.”** The National Research Council

Committee on Increasing National Resilience to Hazards and Disasters, et al., 2012.

[http://www.nap.edu/catalog.php?record\\_id=13457](http://www.nap.edu/catalog.php?record_id=13457)

*Communities and the nation face difficult fiscal, social, cultural, and environmental choices about the best ways to ensure basic security and quality of life against hazards, deliberate attacks, and disasters. This paper includes information on a foundation for understanding, managing, and reducing risks; making the case for resilience*

*investments; measuring progress; building local capacity; and taking other steps toward resiliency. The publication is located here:*

**ICLEI's "Resilient Cities Series: Annual Global Forum on Urban Resilience and Adaptation."**

<http://resilient-cities.iclei.org/>

**The Natural Hazards Center** at the University of Colorado was founded by Gilbert White, one of the foremost experts in flood dynamics and recovery. Much of his work was based on or inspired by the flood history of Boulder. More information on the center can be found here: <http://www.colorado.edu/hazards/about/>. The Center's current Director, Dr. Kathleen Tierney, has written a useful case study of the **Tulsa Disaster Recovery/Resilience Case** summarized below. *Tulsa, Oklahoma, experienced a series of highly damaging floods in the 1970s and 1980s and is an example of how a community can significantly increase its resilience by creating a broad-based engagement and involvement of the many different segments of its community. Tulsa developed some of the most progressive flood management programs in the country and is recognized as a national leader in disaster preparedness. Actions included the creation of a public-private sector collaborations in disaster preparedness called Tulsa Partners; establishment of "Citizen Corps," a Department of Homeland Security program engaging and preparing community volunteers for disaster preparedness and response activities; and a joint initiative with the insurance industry called "Disaster Resistant Business Council."*

**Additional publications:**

**"Resilience in Ecology and Urban Design: Linking Theory and Practice for Sustainable Cities"** S.T.A. Prickett, et al., 2013.

*Contributors propose strategies to make urban environments more resilient.*

**"The Nature of Urban Design: A New York Perspective on Resilience."** Alexandros Washburn, 2013.

*Includes a chapter on the role of urban design in increasing resilience.*

**"Resilient Cities: Responding to Peak Oil and Climate Change."** Peter Newman, Timothy Beatley, and Heather Boyer, 2009.

*This book draws on existing initiatives from around the world to demonstrate the potential for urban resilience. Its application is much broader and more closely associated with general attributes of sustainability than other resources.*



# SUSTAINABILITY FRAMEWORK

The city is continuously working to provide service excellence for an inspired future and moving towards the vision of One City, One Boulder. As part of this effort, the sustainability framework helps to provide a common language for community and City Council goals and priorities and ensure alignment across the city organization.

The framework uses seven broad categories as desired community outcomes necessary for Boulder's vision of a great community. When the city implements the strategies outlined in this framework, then Boulder will have a Safe, Healthy & Socially Thriving, Livable, Accessible & Connected, Environmentally Sustainable, and Economically Vital Community and provide Good Governance. Strategies to achieve those outcomes are developed and advanced in the annual budget as well as strategic and master plans.

## GETTING AWAY FROM "SILOS" TO WORK TOWARD MULTIPLE GOALS

Alignment across the organization with the wide range of community priorities, allows the city organization to evaluate whether or not expectations are being met and to more nimbly adjust, if necessary. Overall, the framework encourages holistic, systemic thinking and allows for more strategic decision-making as the city moves together in the same direction. There are key concepts like resiliency, equity and engagement that are embedded in each category because they are essential in all areas.

## USE THE FRAMEWORK IN PLANS, PROJECTS AND KEY INITIATIVES

Specific initiatives to achieve these Boulder outcomes and strategies are outlined in greater detail in master/strategic plans and the city's budget. Certain multiple-objective or cross-departmental projects will benefit from using the framework to guide strategies but it may not be effective or applicable for all projects. Efforts are ongoing to align the framework with budget process and key initiatives.



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**LIVABLE COMMUNITY: When the City of Boulder...** sustains and enhances a compact development pattern with appropriate densities and mix of uses that provides convenient access to daily needs for people of all ages and abilities; supports a diversity of housing and employment options for vibrant and livable neighborhoods and business districts; and maintains abundant and accessible public gathering spaces... then it will be a **Livable Community**.



**ACCESSIBLE & CONNECTED COMMUNITY: When the City of Boulder...** maintains and develops a balanced transportation system that supports all modes of travel; maintains a safe system and shifts trips away from single-occupant vehicles; and provides open access to information, encourages innovation,

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# Sustainability Framework



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### SAFE COMMUNITY:

- Enforces the law, taking into account the needs of individuals and community values
- Plans for and provides timely and effective response to emergencies and natural disasters
- Fosters a climate of safety for individuals in homes, businesses, neighborhoods and public places
- Encourages shared responsibility, provides education on personal and community safety and fosters an environment that is welcoming and inclusive



### HEALTHY & SOCIALLY THRIVING COMMUNITY:

- Cultivates a wide-range of recreational, cultural, educational, and social opportunities
- Supports the physical and mental well-being of its community members and actively partners with others to improve the welfare of those in need
- Fosters inclusion, embraces diversity and respects human rights
- Enhances multi-generational community enrichment and community engagement



### LIVABLE COMMUNITY:

- Promotes and sustains a safe, clean and attractive place to live, work and play
- Facilitates housing options to accommodate a diverse community
- Provides safe and well-maintained public infrastructure, and provides adequate and appropriate regulation of public/ private development and resources
- Encourages sustainable development supported by reliable and affordable city services
- Supports and enhances neighborhood livability for all members of the community



### ENVIRONMENTALLY SUSTAINABLE COMMUNITY:

- Supports and sustains natural resource and energy conservation
- Promotes and regulates an ecologically balanced community
- Mitigates and abates threats to the environment



### ACCESSIBLE & CONNECTED COMMUNITY:

- Offers and encourages a variety of safe, accessible and sustainable mobility options
- Plans, designs and maintains effective infrastructure networks
- Supports strong regional multimodal connections
- Provides open access to information, encourages innovation, enhances communication and promotes community engagement
- Supports a balanced transportation system that reflects effective land use and reduces congestion



### ECONOMICALLY VITAL COMMUNITY:

- Supports an environment for creativity and innovation
- Promotes a qualified and diversified work force that meets employers' needs and supports broad-based economic diversity
- Fosters regional and public / private collaboration with key institutions and organizations that contribute to economic sustainability
- Invests in infrastructure and amenities that attract, sustain and retain diverse businesses, entrepreneurs and the associated primary jobs



### GOOD GOVERNANCE:

- Models stewardship and sustainability of the city's financial, human, information and physical assets
- Supports strategic decision-making with timely, reliable and accurate data and analysis
- Enhances and facilitates transparency, accuracy, efficiency, effectiveness and quality customer service in all city business
- Supports, develops and enhances relationships between the city and community/ regional partners
- Provides assurance of regulatory and policy compliance



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