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VIA E-MAIL

March 11, 2018

Mr. Nick Shufro

Mr. Vincent Brown and
The FEMA NMIS Team
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RE: Comments on Draft National Mitigation Investment Strategy

Introductory Comments:

With thanks to the FEMA National Mitigation Investment Strategy (NMIS) team, the authors writing for the Natural Hazard Mitigation Association respectfully submit the following comments on the Draft NMIS.

The Natural Hazard Mitigation Association is an organization devoted to the reduction of disaster risk and the unnecessary losses too often suffered from foreseeable events and sequences of events. We are pleased to have the opportunity to comment with our support for the development of additional incentives for increased hazard mitigation, and to thank FEMA for creatively pursuing these issues.

The comments are largely general in nature, with the exception of a comment on the use of higher standards and significantly reconceptualized building codes to leverage the trillions of dollars of private market investment that will take place over the next decades as our Nation grows and as replacement of outdated community development takes place. We strongly suggest that the current focus of the document on federal investment be expanded to consider pragmatic and critical private market investment which should be better guided so as to achieve Disaster Risk Reduction. Focus on greatly changed concept of building codes, from the present focus on life safety almost exclusively be changed to include life safety, of course, but also include cost effective consideration of Disaster Risk Reduction and post event operability. For this issue we wish to offer strong endorsement of investment in improvement. The Association would be pleased to respond to any inquiries or requests for further explanation.

We also note the serendipity of timing of the Draft National Mitigation Investment Strategy with the availability of the "Mitigation Saves 2.0" report, which provides authoritative support for the fiscal rationale for substantial investment in mitigation.¹

¹ Multihazard Mitigation Council (2017) Natural Hazard Mitigation Saves 2017 Interim Report: An Independent Study. Principal Investigator Porter, K.; co-

Principal Investigators Scawthorn, C.; Dash, N.; Santos, J.; Investigators: Eguchi, M., Ghosh., S., Huyck, C., Isteita, M., Mickey, K., Rashed, T.; P. Schneider, Director, MMC. National Institute of Building Sciences, Washington <https://www.nibs.org/page/mitigationsaves> (accessed last 03 Mar 18).

The over-arching goal of more coordinated investment in mitigation is of national importance, as illustrated so unfortunately in 2017 by record-breaking losses and rapid sequences of weather extremes and suffering from those events. The need for increased investment certainly includes the need for effective investment. We note also that awareness of the scope of needs for mitigation, as economically rational and humane, is coupled with the need for reinvigoration of basic infrastructure² and improved service efficiency. Despite some measures of economic prosperity, we can ill afford poor investment, and we can ill afford abrupt withdrawal of major federal programs, or abrupt changes in insurability and risk reduction.³

With thanks for the explanatory cover note, we submit particular comments on the Draft NMIS.

P 1: Principle 1: Unfortunately, success in catalysis of private and non-profit sector mitigation investments and innovations may be adversely affected by changes in the tax structure which included an indirect form of disaster relief through the casualty loss deduction provision. Recently, this has been narrowed in the case of disasters to those which are Presidentially designated disasters (Delgadillo 2018)⁴. The vast majority of loss incidents are lesser in scale, dollars and victims, and less consistently documented, but these events may provide an under-supported market for innovations and investment. The recent change unfairly penalizes injured persons and businesses in smaller events. In all cases of hazard losses, there could be a powerful **incentive for mitigation if direct losses were casualty losses and mitigation were privileged**. If mitigation investments (e.g. uninsured costs of elevation or earthquake resistance retrofits, etc.) could be deducted over some period of time (perhaps ten years) to provide effective reduction in cost with relatively short pay-out, easier financing of private mitigation might stimulate significant investments. Further, such a policy **might enable use of mortgage-associated financing, such as home equity loans and re-finance, as forms of innovation** in residential finance and finance for commercial property. Standards for qualification would likely involve an inspection, but inspections are already common for building permitted activity.

P 1 Outcome 1, lines 32 and 33: These important goals of common vocabulary and common metrics might best be pursued with a series of **invitational workshops** to examine vocabulary and metrics as they are evolving in different fields, including but not limited to: (a) engineering; perhaps in collaboration with the ASCE and the National Institute of Building Sciences, and perhaps starting with the recent report on cost-benefit of mitigation, and see Kurth et al. 2018⁵; (b) floodplain and wetland management; perhaps in collaboration with the Association of State Floodplain Managers, Association of State Wetland Managers, and the relevant FEMA advisory groups including the Technical Mapping Advisory Council; (c) a group of state hazard mitigation officers and some city mitigation officials; (d) a group focused on climate adaptation at state and city levels, and the leading NGOs and philanthropies; and (e) a group of academic researchers, perhaps in collaboration with the National Academies and the Hazards and Disaster Research Centers (e.g. University of Colorado, University of Delaware, Texas A & M, etc.). **The disaster centers might be able to host such discussions at low cost.**

² See American Society of Civil Engineers, 2017, 2017 ASCE Infrastructure Report Card. <https://www.infrastructurereportcard.org>.

³ Reforming Federal support for Risky Business, Authors: David Conrad and Edward A. Thomas Esq., in *15 Ways to Rethink the Federal Budget*, Edited by Greenstone, Harris, Li, Looney and Pastashnik, Brookings Institute Hamilton Project, 2013. Located at: <http://www.brookings.edu/research/papers/2013/02/reform-federal-support-risky-development> and A Three-legged Stool on Two Legs: Federal Law Related to Local Climate Resilience Planning and Zoning, by Sarah J. Adams-Schoen and Edward A. Thomas, peer reviewed article in American Bar association publication *The Urban Lawyer*, 47 URB. LAW. 3 (2015). Located at: http://nhma.info/wp-content/uploads/2016/02/UL-47-3_08Adams-Schoen-Thomas.pdf and Natural Hazard Disaster Risk Reduction as an Element of Resilience: Considerations about Insurance and Litigation by Edward A. Thomas, Esq. (2016) In Linkov, I., & Florin, M.-V. (Eds.), *IRGC Resource Guide on Resilience*. Available at: <https://www.irgc.org/risk-governance/resilience/>

⁴ Delgadillo, N., 2018, How the New Tax Law Could Slow Disaster Recovery in Small Towns. *Governing the States and Localities*: 16 Feb 2018; <http://www.governing.com/topics/transportation-infrastructure/gov-tax-overhaul-gop-casualty-loss-deductions-natural-disasters.html>. Accessed 04 Mar 18.

⁵ Kurth, M, Kennan, J., Sasani, M., Linkov, I. (2018, under review). "Defining Resilience for the Building Industry in the U.S." Building Research and Information.

There would be great value in a common vocabulary, but it would have to accommodate a lot of distinct threads (e.g. the basis of resilience as a term has been haggled and discussed in almost every relevant document, but without much clarity added to the somewhat intuitive sense or the ecological sense. An initial question is whether some of these fundamental ideas are indeed similar or not (see Kurth et al., fn 5) and if there are consequential differences in the current usages. Thus, it would be valuable to have focused inquiry within communities of interest and emerging communities of practice. FEMA, in the past, has changed the vocabulary over time; e.g. Map Modernization to RiskMAP. If vocabulary is standardized, effectiveness would be assured with widespread commitment among industry leaders to adopt and use the vocabulary (or thesaurus in the case of cataloguing) and to resist change without consensus.

P 1: Outcome 1: lines 34-37: These two outcomes (complementary processes, modify federal processes) are somewhat similar to goals for cleaning up the project permitting requirements for many kinds of infrastructure, such as water management projects. The **essential problem has been different statutory specifications**, leading to different regulatory requirements and independent development of methodological specifications, and sequential requirements so that subjects and topics of inquiry are revisited and information is revised, reformatted and resubmitted, dragging out processes. This also obscures valuable information and makes it very difficult for the public and persons outside of a given specialization to get a clear view of the issues and gaps in knowledge or predictability. For professionals, the variations in format, specifications, and methodologies and reporting complicate and hinder achieving effective cumulation of knowledge and avoiding repetition.

Given the core requirement of some kind of planning and assessment to qualify for most forms of assistance, relief and recovery at all levels of government, one idealized answer to these two outcomes of complementary processes for application for funding and holistic approaches would be **to standardize the “check-list” of elements of assessment and planning, and the qualities required to satisfy the needs**. It would be possible to specify the required elements for any given formal regulation, with program specifications made conforming to statute and regulations adjusted for cross-program clarity and coherence. In the event of an application, a particular program might not, under the relevant statute, involve all of the elements. But the pre-event planning, seeking a holistic approach, would be at first laborious and afterward, much easier to update and adjust as conditions and goals change. The comprehensive planning approach, as with the “whole community” approach, would reflect the original ideas of much of planning: a broad and holistic approach which is cumulative, rather than constantly re-initiated.

In pursuit of this, **a pragmatic approach might be intensive effort with philanthropic assistance and a small number of states to develop the list of elements and the links between them**, and the desirable standards of data and analysis. Subsequent planning and revisions would be modified to conform to the elements and links, creating cumulation and regional coordination possibilities. For example, one element is likely to be adequate flood-plain mapping (e.g. as recommended by the Technical Mapping Advisory Council), with guidance on the best practices for such approaches as use of LIDAR, use of National Agricultural Imagery Program, use of updated hydrological information and tools such as the National Water Model. The appropriate role for State agencies would depend on the capacity available. Regional coordination would require use of the same methods and tools for easiest progress; this might be State scale or multi-state where linkages are particularly relevant (e.g. hydrologic connections).

This re-vamping of the planning process would enable implementation of improved standards for local government planning, partly by providing minimal standards for use of available information, and partly by provision of approved data sets and how to use them. By inclusion of the whole set of relevant elements (demographics of populations of interest, etc.; digital elevation models; hydrologic modeling; assessment of other hazards; assessment of relevant social conditions), there would be substantial increases in the holism of the basic plan. When applied to evaluation of new development, the holistic approach is central in the reduction of unintended consequences. When used for applications for funding, the quality control would have been done and the application would deploy materials already in hand.

This goal could also extend to the range of other federal funding programs for support of infrastructure, housing and urban development, and many others. Progress toward true comprehensive planning is not a prescriptive lock-down of future choices; performance standard planning is more likely to meet the needs while providing

variety of decisions and outcomes. The critical elements, however, are similar, such as reduction of the speed and volume of stormwater run-off with potential to impact places downstream, and the reduction of up-stream conditions that increase risks.

Therefore, we recommend that the logic of the “whole community” approach be extended to the “**whole plan**” **approach**. Pilot projects with financial support might be expansions of ideas such as the Rockefeller 100 Resilient Cities approach. Perhaps ironically, the initial steps after the pilot project locations are identified might be the same as those in urban-scale whole community processes: persistent purposeful and adequately-supported interactions to develop mutual understanding and the basis of successful collaboration and problem identification.

P 1: Outcome 1: improve coordination: The integrated assessment and planning process recommended above would serve these goals, as well. The first steps might be the pilot efforts described with scope directed to mitigation, and later, directed toward the wider set of planning efforts and grant and assistance programs. We suggest starting with the FEMA and HUD since many collaborative efforts have already taken place between the two agencies for match programs to successful e.g. FEMA and HUD agreeing to use one EHP clearance for Sandy PA match vs. each agency requiring a separate environmental clearance.

PP 1-2: Outcome 1: lines 42-46 and 1-3: financial products, innovation investments, non-traditional models for finance, increase insurance: It is desirable **to avoid the risks of exorbitant costs and lack of accountability and quality control that may arise in under-informed, inappropriate or predatory public-private “partnership” deals**. The underlying issue is **self-crippling tax limitations** at the state (and perhaps federal) and local levels, in which short-term political pressures result in insufficient maintenance, back-logs of needs, and inability to maintain funding commensurate with needs for steady expenditure on public facilities, and preventing accumulation of funds needed for lumpy costs. The failure to provide for known needs, as shown in the American Society of Civil Engineers’ Infrastructure Report Card series (supra, footnote 2), carries over into failure to provide for growth needs, and failure to provide for increasing needs from changing hazard conditions.

We wish to note that **traditional funding models** have much to recommend them; the attacks on government spending are attacks for many rationales which are sometimes inappropriate. “Run it like a household!” seems a common sentiment, not clearly informed on the use of long-term debt in mortgages and purchase of expensive items such as automobiles and appliances. In government, the use of bonding and other debt may quite desirably **match the costs over time to the benefits over time, and thus match the beneficiaries and users to the funders**.

There is a fundamental issue which we urge be soberly considered in a series of regional discussions and a national report. If a person refused to save adequately for future needs, to what extent **should the taxpayers be responsible for rescue?** If a state refuses to save adequately for future needs, to what extent should the federal taxpayers be responsible for rescue? And, of course, there is another issue of the extent to which the federal and other funding is adequate to meet the needs which are arguably related to basic human rights. Accountability is an abstract *idea*; malnutrition of children is not so abstract. Exposure to foreseen hazards and preventable losses (e.g. from maldevelopment in dangerous flood areas) is not so abstract.

Preventable disaster losses are difficult to assign, but we can start with **existing allocations of responsibility**. The interstate highways, for example, have been regarded in the past as a federal investment in national security, and then in national commerce, and later partly the responsibility of States and local governments. The railroads received incredibly large subsidies for provision of transportation capacity; Justice Frankfurter’s memorable phrase was that the area of land given for the transcontinental railroads is equal to that of the New England States plus New York plus Pennsylvania. We now face, with the dismissal of passenger and local freight service, and the dismal condition of more local rail and light rail/subway services in many places, a decision point about how to proceed. Evacuation as a disaster response has not apparently so far resulted in provision of supply and response capacity for jammed highways or special provision of transit, rail, and bus systems for evacuation on appropriate scales. Similarly, with decaying infrastructure of other sorts, we face decisions about the responsibility or irresponsibility for risk-related infrastructure such as the adequacy of critical facilities.

Rather than seeking minor incremental changes, the National Mitigation Investment Strategy rightly seeks to promote investment which furthers long-term needs. But, here, in the financial aspects, the question is how to address previous allocations of responsibility and whether to revise them. **We urge an additional set of inquiries in which the development industry in general and also a sample of several state budgets and sets of investments be modeled with several alternatives.** For example, in a Rust Belt state, what would financial burdens look like if there were (1) continuation of present policies (reactive event-based disaster relief, little investment in pro-active mitigation, building and design codes which are not responsive to current and future conditions, and little or no change in federal-state-local cost shares), versus (2) decreased federal share of costs, increased state shares, versus (3) decreased federal shares, decreased state shares, and either increased local shares or (4) decreased levels of service and performance at all scales. How about for a largely rural state? How about for a highly urban state in the West? The recent federal tax changes warrant a cold-eyed look at the decrease in service quality as well as social well-being resulting from withdrawal of federal capacity without replacement by states which decline to provide service and well-being finances.

Regarding insurance coverage, we urge that the re-insurance company thought-leaders and the domestic insurance providers supply best-available actuarial risk estimates and predictions for the major natural hazards and the likely combinations and cascades of hazards (e.g. wildfire, wild-land urban interface fire, and floods with water system consequences). The risk and fact-based decisions called for would be improved with better information about the extent of risks and likely consequences.

P 2: Lines 13-18: Information and tool sharing: This is desirable, both in improving usefulness of federal data, and ideally facilitating access to data with high quality control and standardized methodologies. Benefit-cost analysis, for example, for the life-time evaluations, might be improved with a set of discount rates that could reflect the historic distribution of rates, to enable comparisons across different financial scenarios.

We suggest adding to the second goal of finding and sharing leading practices and case studies on mitigation investments **an additional specified goal of improved accounting and analysis** of the range of evaluation practices relevant to multi-purpose investments such as green infrastructure, and an additional goal of periodic evaluations of decision support tools to enable wise choices for particular purposes, and further, support for tool development using easily-accessible data with good quality control. We also suggest improved accounting for the socioeconomic benefits; capacity to do this is rapidly improving. ⁶ Some federal agencies like HUD take into consideration other factors that FEMA does not allow. This ties back to the “whole plan” approach.

P 2: Lines 20-27: Risk communication and education with improved assessment: As in the previous comment, we recommend tool evaluation and characterization for community resilience as well as response decision support, as an **active periodic effort**. Improving mitigation education and outreach, and application of the science of risk communication must be explicitly enabled for federal and SLTT agencies which are presently constrained by laws, regulations, and policies which were intended to prevent agencies from pursuing support for pet projects or otherwise intruding on legislative interests and functions. The appropriate balance would be public comment periods and notation of how to access critical views. Private and non-profit entities have no such constraints, but the **public sector should be enabled to note critical views on risk communications which are not clearly accurate**; an example would be deliberately falsified communications on the health risks of smoking, and on the science of climate.

Ultimately, because of the appearance of counter-factual positions, such as the denial of evolution in schools, there are profound issues related to what is demonstrable and what is something else. The imposition of impossible standards to disqualify understandings of our changing and complicated world, and the development of scientific understanding, is a problem particularly related to changing natural hazards. We support referral to

⁶ A leading non-governmental organization dedicated to improved and defensible valuation is Earth Economics (www.earthconomics.org); there is also a substantial literature in economics and resource economics, too large to describe adequately here. The dominant landmark in the past was the Millennium Ecosystem Assessment (2205 and other dates); <http://www.millenniumassessment.org/en/index.html>. In the following 12 years, hundreds of publications have addressed advancements in methods and data.

the National Academies of the **development of multi-level statements aimed for different levels of education, to enable capacity to understand risk communications**. For example, there are still many persons who insist that the changes in weather-related hazards are just outliers on a cyclical process, rather than changes related to increased variability and increasingly energetic processes. The point that one is entitled to one's opinion, but not one's own facts, is relevant. The utility of risk communications is strongly related to the **necessity for a common platform** of understanding, which in turn is part of the fundamental linkage of adequate public education and functional democracy; indeed, the attacks on public education reflect many concerns, including inadequate funding, excessive demands on the educational systems to substitute for other roles in socialization, and the facilitation of disinformation campaigns. Chemistry, physics and arithmetic are not political. But marketing success is not apparently related to correct information, so in the short term, we might benefit from lessons learned in sales.

We must embrace as a profession that communication methods used 10 years ago are no longer valid to reach the masses. Social media should be at the for front of this topic and relevant companies engaged.

P 2: Lines 29-37: Outcomes in the built environment: We appreciate this set of outcomes, and urge that there be added **an additional point**. The statement by Dr. Arthur Chris Nelson that half of the built environment that will exist in the US in just a few decades does not now exist is a strong reminder that better considered and up-to-date building codes (and we add, design and planning standards) are critical for risk reduction.

But we must also address the half that already exists, much of which could be substantially improved in safety, energy efficiency, and other aspects of resilience. Therefore, we suggest that there also be passage and enforcement of **standards for renovation and any post-disaster supported restoration**. This is certainly a financial burden, but the benefits seem very likely to outweigh the costs for several generations, given the length of service of much of the housing stock. Therefore, the reduction of financial risks and costs is of benefit to the public as well as the owners and tenants of the housing stock in need of improvement. We urge at least a careful **modeling effort to examine the net outcomes of an extension of the idea of tax deductions for catastrophic losses to include mitigation costs**, perhaps spread over several years, of improved rebuilding or restoration to safer standards. A house that is raised should not have inadequate wiring or plumbing, or failure of adequate measures for other hazards (e.g., a tornado safe room may be appropriate).

We applaud the principle of **nature-based solutions**, and urge increased efforts to develop full and defensible accounting for the wide range of benefits.

We applaud the principle of **building back better**, and urge that the Stafford Act limitations on improvement be repealed. That would substantially further the long-term reduction of risks and costs, and support the outcome of encouraging local and regional investment to enhance security and resilience.

PP 2-3: lines 39-46 and 1-7: Anticipated benefits: We suggest addition of a phrase explicitly noting that benefits include **reduction of opportunity costs**, which are those costs of foregone opportunities which are not feasible because of need to spend to "get back" or restore, rather than to advance. This may be particularly useful for public outreach and education.

P 8: Principle 2: Improve collaboration, use local expertise: This principle might be strengthened with some acknowledgement of **the problem of failure to mitigate** by SLTTs, or failure to acknowledge risks, for reasons of political preference of some, or reasons of self-crippling revenue policies. Among the issues that raises are environmental justice, social equity, and ideas of human rights to be free of foreseeable and preventable dangers, all of which warrant a more intensive discussion.

P 8: Principle 3: Risk-informed, lifetime costs and risks: Because the **choice of discount** rate to be applied is a well-recognized problem, it is wise to perform such analyses with a range of discount rates, to accommodate the likelihood of highly variable and changing economic conditions during the long life of many investments; they may

actually be effectively timeless where there is investment in permanently conserved open space as in green infrastructure.

P 12: Re: point stated elsewhere as well as P. 12 line 19: The Stafford Act should be revised to explicitly encourage “building back better”. That alone would break some log-jams in recovery and might dramatically increase mitigation in post-disaster recovery and allow planning in pre-disaster for improvements in mitigation and resilience. This is very likely to reduce total costs, and judging by the National Institute of Building Sciences recent interim report, would be highly cost-effective and often within short time spans.

P 13: Comment: Re: Outcome 1: as commented above, we recommend an explicit effort to develop common vocabulary and metrics, and exploration of a process to provide a framework for comprehensive planning, within which different actors may develop complementary planning and processes, to achieve the holism needed and integration of mitigation into continuous processes.

P 13: Lines 34-36: Remarks on improved healthcare outcomes: There is also need for improved planning, capacity and implementation regarding long-term public health studies of disaster impacts and thus costs imposed and often shifted (e.g. on non-disaster specific public well-being and health care programs; (see Deryugina, 2016)⁷ .

As natural hazards increasingly interact with created and technological hazards (e.g. the petrochemical industry in the Hurricane Harvey area) and biological hazards (e.g. repeated flooding of concentrated animal production operations in North Carolina), long-term impacts increasingly require observation and competent response.

P. 15: Lines 2-11: Coordination: As noted above in general comments, we recommend explicit efforts to **consider common metrics and means of comparative evaluation**. This is complicated by the inherent problems, and also by the different weightings from different interests (e.g. interests in net dollar values may differ sharply from interests in environmental justice/equity in exposures). Explicit examples of such weighting differences should be taken from the published literature and elaborated for policy discussions. It may be desirable to establish models for different kinds of comparisons which are inherently non-commensurable (e.g. value of health versus employment).

P. 15: Re: Recommendation 1.3: complementary timelines, streamlined applications: Please see general comments above; we recommend **a comprehensive approach enabling assembly of a holistic view** where the information is available, gap identification, and selection of elements relevant to a particular application. The idea of a “wizard” and portal for assistance seems well worth pursuing in coordination with a pilot project to undertake comprehensive planning/application processes; it may be most useful to develop these together. We support the NIST project noted, (fn. 23, Draft NMIS, p 17), and the pilot testing.

P. 19: Outcome 2: Private and non-profit sector increase investments: We note in regard to the role of philanthropic organizations and NGOs in mitigation projects that although there is no clearinghouse or organized and accessible information on who is doing and funding what, we suspect there is very little interest in directly investing in specific projects (such as aiding in cost-share requirements for mitigation projects). It is our experience that the big philanthropic organizations are more inclined to invest in projects which are intended to provide transferable lessons and experience. It may be important for encouraging private investment in mitigation innovations to design and seek projects which will provide transferable lessons and examples. For instance, one might undertake a high-quality study of the costs and benefits, including the full range of co-benefits, of a green infrastructure/nature-based solution project which could serve as a template and example for others considering

⁷ Deryugina, T., 2016, The Fiscal Cost of Hurricanes: Disaster Aid Versus Social Insurance.” Working Paper 22272. Cambridge, MA. National Bureau of Economic Research. <http://www.nber.org/papers/w22272>.

methods for evaluation, perhaps including a decision tree and examples of different discount rates, and ways to include financing costs of different tools such as general obligation bonds, special district methods, etc.

While we greatly appreciate the intent of seeking private investment, we recommend that FEMA be explicit about seeking at least two kinds of private investments: those which are intended to support transferable lessons and experience, and those which might be explicitly local. The latter kind of project would include work with local land trusts, for example, as private investments in open space which might be designed to work as nature-based solutions for floodways/greenways, and stormwater detention and management (and storage) downflow from highly-urbanized areas. Improved coordination goals, as supported in the NMIS, could be furthered by developing more coordination with local and regional groups in land conservation, watershed improvement, and similar goals.

That also leads to efforts such as facilitation of coordination with Soil and Water Conservation Districts, and improved outreach and coordination with USDA conservation programs. Programs such as the Environmental Quality Incentives Program, administered by the Natural Resources Conservation Service, could be important support for mitigation programs.⁸

We note, also, that “whole plan” ideas for “whole community” thinking might be a valuable investment in facilitation of cross-agency and cross-sectoral work, and that a set of experiments including tax incentives, rewards and name recognition of model corporate and state or local investments designed to achieve Disaster Risk Reduction will provide valuable and transferable lessons in how to undertake such activities, and in identification of barriers and changes desirable to make such efforts easier and better.

We also suggest that private-sector responses to tax-modifying incentives would be a valuable subject for research, and that this would be particularly timely as a complement to the increased attention focused on different kinds public-private partnerships and privatization.

We note that the Draft NMIS proposes no further research, and we suggest that pursuit of decisive action is not incompatible with advances in understanding. Further, philanthropic investments and NGO research have frequently demonstrated that privately-funded work can be as productive and stimulating as government-funded work.

PP 25-26: Recommendation 3.1, coordinate for more targeted training: We suggest **qualification of the term “community”** to recognize that there are often quite sharp differences in perception of community in the intended sense of persons with a shared perception of interests and exposures and vulnerability; racial, economic and other differences have important impacts on perceived commonality and all too often on relationships to assistance, preparation, and responses to needs.

PP 38-39: Recommendation 6.1: Incentivize better building codes: While up-to-date building codes are certainly desirable, and would be important progress from obsolete codes and/or absence of adequate enforcement, there is **greater benefit possible from codes which incorporate better goals**. In particular, advanced codes are highly desirable especially for critical facilities and life-line infrastructure in areas of present and future high risk (e.g. current floodplains and areas which will be more exposed with upstream development, changes in precipitation, wildfire, etc.).

In particular, given the age and purpose of the FIRM maps for the majority of areas mapped, it is **essential that the FIRM mapping be modernized, as recommended by the Technical Mapping Advisory Council, and to achieve two goals**. First, the intention and purpose of Base Flood Elevation mapping should be to identify risk areas with much higher confidence, such as 95% rather than 50% and much stronger safety factors. The problems of misunderstanding of the FIRM maps were horribly illustrated in Hurricane Harvey, for example, where an infamous photo showed wheel-chair-bound elderly clients of a nursing home who were up to their chests in flood waters were across the street from a FIRM area boundary. The best approach at present, **given the gaps**

⁸ See <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/>

and problems with old maps made for reasons we would now change, and with old information, is to strongly encourage 4 or more feet of freeboard and to incentivize this with a change in the Community Rating System. Given the uncertainties of future conditions, and the small marginal cost increments for additional safety, it would be wise to incur small additional costs to avoid potential disaster in the event of surprises. The “Mitigation Saves 2.0” report (Multi-hazard Mitigation Council, supra, fn. 1) has provided information on “beyond code” valuation.

The NFIP minimum standards are now about 50 years old; updating is overdue. There are new standards available in the widely-used International Building Code and International Residential Codes /ASCE-24 standards set.⁹

The NHMA congratulates the FEMA FIMA Building Science Branch of the Risk Reduction Division, for their ongoing success in guiding a gradual evolution of model building codes in the direction of requiring considerations of Disaster Risk Reduction in addition to life safety considerations, specifically we suggest:

“Building codes, if they are followed (the International Code Committee estimates that only 65% of buildings built in the United States follow the national building codes), are merely intended to prevent collapse in the largest events. Protection of property and business continuity are not typically considered. **Giving owners, tenants, lenders, insurers, government jurisdictions and other building stakeholders reliable information on the performance of their buildings, rating systems for buildings allows these groups to make actionable and informed decisions** about purchasing, leasing, refinancing and insuring buildings, and to support development of long-term strategic risk and resilience management solutions.” (Reis et al. 2016; emphasis added.)¹⁰

At the 2016 Building Innovation Conference and Expo, sponsored by the National Institute of Building Sciences, Dr. Keith Porter suggested that if the goal of building codes were to be resilience, costs would increase about 1%; the savings in areas prone to earthquakes would be many multiples of the extra costs. In following the earthquake example in the above paragraph, earthquake codes could be modified as Dr. Porter suggests from current standards to a more holistic one: “Ordinary buildings in earthquakes will: ‘Avoid serious injury and life loss due to structural collapse, substantial damage to nonstructural components and systems, and release of hazardous materials, and be **largely habitable or functional.**” [Emphasis added.] The codes should be modified for other foreseeable natural hazards as well to incorporate resilient standards into our development practices and avoid the costly scenario of losses and future retrofits. The flood case would specify freeboard recommendations as well as improved mapping to meet current capacity and needs. In the case of floods, the NFIP Community Rating System offers a very good opportunity for incentives for higher standards.

More detailed argument and information is available in Multihazard Mitigation Council (2017) Natural Hazard Mitigation Saves 2017 Interim Report (supra, fn. 1). See especially 2.2.1, 2.7, 3.3.2, 3.9, 5.3, and Appendix J and Appendix M. The benefit-cost ratio for federally-funded mitigation for riverine flood is 7:1; for exceeding code requirements, it was found to be 5:1 (p. 1); there are also high ratios for other mitigation of other hazards.

⁹ Flood Resistant Design and Construction (<https://ascelibrary.org/doi/book/10.1061/asce24>; see also https://www.fema.gov/media-library-data/20130726-1643-20490-4974/asce24_highlights_dec2010.pdf for introduction, and FEMA, 2014, “2015 Flood Codes, Standards, and Building Science Tools”, https://www.fema.gov/media-library-data/20130726-1643-20490-4974/asce24_highlights_dec2010.pdf); See also H.R. 4460 “Disaster Recovery Reform Act” (Reps. Barletta and Johnson, 28 Nov 17), calling for clear authority to “build back better” has been endorsed by the American Society of Civil Engineers, <https://www.infrastructurereportcard.org/legislation-advocates-for-resilient-re-building/> would amend the Stafford Act to enable rebuilding to higher standards and building codes, and see BuildStrong Coalition, <https://forum.buildstrongamerica.com/>.

¹⁰ Reis, E., S. Hanson and T. Neary, 2016, Building Resilience: Using Rating Systems to Mitigate Disaster Risk. Risk Management Magazine, 01 Sep 2016; <http://www.rmmagazine.com/2016/09/01/building-resilience-using-rating-systems-to-mitigate-disaster-risk/>.

An additional treatment of the value of higher standards is provided in FEMA, 2014, FEMA Presentation: 2015 Flood Codes, Standards, and Building Science Tools and other sources.¹¹

Further, conservative safety measures are important for prevention of costs being imposed on others, including taxpayers, due to risky development. SLTTs have unquestioned authority to prevent development which imposes risks and costs on others, with a clear showing that requirements are based on public safety and the prevention of harm to others (See, Koontz case: "Insisting that landowners **internalize the negative externalities of their conduct** is a hallmark of responsible land-use policy, and we have long sustained such regulations against constitutional attack." (*Koontz v. St. Johns River Water Management District*, 570 U.S. 2588 (2013)).

We note that despite the repeal of mandatory application of the **Federal Floodplain Risk Management Standard, it was and is good policy, though it could be stronger**. Putting taxpayer-funded facilities at risk, and critical facilities of any origin at risk, is fiscally wasteful and may threaten lifelines and critical recovery needs.

Finally, we support application of the best available science of extreme weather events and changing hydrology in development of improved mapping of risk, improved FIRMs, and safer location of all development, particularly including critical facilities.

PP 39-40; lines 5-42 and 1-10: Nature-based solutions: This recommendation should also include a thorough **literature and grant review of "green infrastructure" or nature-based** solutions, and call for a periodic conference on the situation and progress in accounting for costs and benefits of nature-based solutions. There is still lack of understanding of the many benefits provided, in terms of social and well-being issues for urban people, and ecosystem services of many kinds (See, e.g., www.eartheconomics.org for efforts in accounting and reports). Following an appropriate conference, possibly co-sponsored with EPA and the Association of Environmental and Resource Economists (www.aere.org), it may be possible to publish a guide to evaluation to enable smaller governments to know what kinds of observations and data are needed, and for agency, consulting and academic economists to apply a template with standards for data to establish minimum evaluations and appropriate statements of omissions and qualifications.¹²

PP 41-42: Comment on Recommendation 6.4: This discussion should recognize the need for **contingency plans for failure of lifelines, and regional assessments** of possibilities for both wide-spread failure and responses. Several areas including the Cascadia, New Madrid, and much of California, for example, may experience truly catastrophic earthquake events. Some coastal areas are now known to be subject to repeated severe hurricane and storm surge events. Extensive ice storms have affected large areas; the potential for more events of that type and perhaps repeated events may now be increasing.¹³

One clear implication is that capacity for local self-help may be more important than it has been, even with the well-known problem of the first 48-72 hours when help may be on the way. As the potential scale of failure across larger areas increases, the time until assistance arrives may be increased. The need for local access to

¹¹ Additional information on the value of "beyond code" building standards is available at: An additional treatment of the value of higher standards is provided in FEMA, 2014, FEMA Presentation: 2015 Flood Codes, Standards, and Building Science Tools (2014 ICC Annual Conference); https://www.iccsafe.org/Education/Courses/Documents/2014ABMPrograms/2015_FEMA_Flood_Codes.pdf. See also Testimony of FEMA Region II Deputy Regional Administrator Michael Byrne, 11 July 2016, <https://www.dhs.gov/news/2016/07/11/written-testimony-fema-house-homeland-security-subcommittee-emergency-preparedness>, on Public Assistance Alternative Procedures.

¹² Consider the differences and similarities in sources such as those cited in fn. 16-19 on P. 40 of the Draft NMIS, and see the extensive collection of resources provided by the NOAA Digital Coast project: <https://coast.noaa.gov/digitalcoast/stories/> and [fn <https://coast.noaa.gov/digitalcoast/data/>]; and other elements of Digital Coast. And see EPA, *Benefits of Green Infrastructure* (last updated Mar. 22, 2017), available at <https://www.epa.gov/greeninfrastructure/benefits-green-infrastructure>.

¹³ US Global Change Research Program, 2017, Climate Science Special Report, Vol. 1 of 4th National Climate Assessment; and forthcoming Vol. 2 – <https://www.globalchange.gov>.

emergency supplies may also involve greater local contact and capacity for management, possibly serving the social cohesion goals noted elsewhere. Effective planning for investment may include improved efforts to provide distribution of emergency life-line substitutes, such as storage or safety improvements for existing pharmaceutical and medical supplies or needed additional distributed resources.

P 47: Investment Strategy Criteria: Mandatory criterion 3 could be more useful with examples of co-benefits and policy goals which would help to satisfy the criterion. In particular, improved safety even in non-disaster daily conditions, for populations of all types might be a valid policy goal, and perhaps especially appealing where the action improves safety for vulnerable populations. This might be actions such as redistribution of emergency response capacity where jurisdictions are fragmented (e.g. by highways or rail lines), rural and remote, or otherwise underserved. For improved mitigation of hazards, investments in local sheltering facilities, multi-purposing other facilities, and similar investments may be valuable in emergencies at many scales.

Mandatory criterion 5 might be stronger with addition of a note that where goals and preferences do not meet this criterion, they may still be pursued by outreach and partnerships with private sector and non-profit groups. The document as a whole will be stronger with examples that would include non-governmental actions which are desirable but beyond authority or capacity of governmental agencies. One example that may emerge as the homeless persons problem expands with reductions of social safety nets is increased sheltering that could also serve the general population in disasters. Another example is the emergence of local small-scale “food hubs” for processing and marketing local food; this is highly desirable for many reasons, but such facilities could also be designed and managed to be available for food service in disasters. Similarly, emergency uses of public libraries and schools are increasingly recommended. Addition of capacities to these facilities might be made credit-worthy for the Community Rating System. These examples also imply that government investment should be considered when it can be incremental to other projects, thus leveraging investments.

Finally, the document should note that part of seeking innovations should also be identification of desirable changes in legislation and authority. The glaring example is capacity to rebuild to higher standards with public and private assistance without excessive paperwork; another change would be allowing and using pre-authorization planning for replacement of dilapidated property (particularly rental and low-income properties) with current-code compliant housing. Local authorities and property owners could be encouraged to undertake planning for improvement and means to avoid displacement of low-income tenants. Given trends in housing for low and middle income people now, such planning should be encouraged and capable of quick implementation in the event of a significant loss or flood insurance pay-out, or disaster relief. Local betterment may be an important incentive for mitigation investments. What changes would be needed for such purposes is a worthwhile inquiry.

P 48: Prioritization Criterion 2: This criterion is misguided; additional research needed should not preclude desirable action in the short term, but there are numerous issues, such as valuation of nature-based solutions, and state-of-the-art assessment of risk communication and educational outreach, where work is needed, including research in the sense of assessment and synthesis, as called for above. The document itself notes the emergence of behavioral economics for use in risk communication; this needs assessment, synthesis, and probably traditional field testing of implications. As written, this criterion’s intent is not clear and would be an obstacle to progress in many areas.

P 48: Prioritization Criterion 7: Science-based estimates and scenarios regarding extreme weather events are rapidly changing (Climate Science Special Report, US National Climate Assessment, Vol 1. 2017, U.S. Global Change Research Program; supra, fn. 10). This criterion is an ill match with the refusal of additional research. Further, periodic updates of estimates and scenarios are necessary, as knowledge and forecasting capacity are increased.

P 48: Prioritization Criterion 9, vulnerable populations: This is highly desirable, and would be stronger if it explicitly noted the desirability of more distributed and disaster-resistant capacity for health care and knowledge of local needs. There are enormous consequences for disaster resilience, and recovery, from the erosion of medical

facilities and places of service. The costs are borne daily by many, and will be sharply higher in the event of disruptive events or disaster.

P 48: Prioritization Criterion 10, public-private partnerships: The dimensions and outcomes of “PPP” arrangements have been quite variable. There is an extensive literature on failures of privatization of water supply; such arrangements are quite variable. We recommend that this be a subject of inquiry (assessment of the research available) to provide guidance on desirable and undesirable features that may be relevant. Because of the high levels of public interest in “PPP” at present, FEMA may be able to request convocation of assessment efforts by sources including the General Accountability Office, the National Academies (have done earlier studies on water system privatization), and universities, perhaps in cooperation with professional groups such as the American Water Resources Association, American Water Works Association, American Society of Civil Engineers, and others. The value of such assessments may be quite high in avoided mistakes or inappropriate decisions, as well as guidance supporting successful plans (e.g. the Lincoln Institute of Land Policy studies ¹⁴).

There are additional options, other than PPP, for local governments to finance infrastructure projects. We recommend that the Mitigation Framework Leadership Group review the white paper titled “Infrastructure Financing: A Guide for Local Government Managers” for additional ideas and insight.¹⁵

We also note that there are other sources of information on finance for relevant purposes, which suggests that an academic group or a university could host a fruitful review of the literature¹⁶

The Natural Hazard Mitigation Association is grateful for the persistence and diligence of FEMA in pursuit of hazard mitigation, and we would be pleased to help further efforts and respond to inquiries.

Thank you,

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¹⁴ See <https://www.lincolnst.edu/search/site/public%20private%20partnerships> for Lincoln Institute guidance on PPP considerations.

¹⁵ International City/County Management Association and Government Finance Officers Association, Chen, Can, and John R. Bartle, 2017, International City/County Management Association. https://icma.org/sites/default/files/308902_Infrastructure%20Financing%20-%20A%20Guide%20for%20Local%20Government%20Managers.pdf

¹⁶ See, e.g. Environmental Defense Fund, 2017, : Unlocking Private Capital to Finance Sustainable Infrastructure (2017) <http://business.edf.org/files/2017/11/EDF-Sustainable-Infrastructure-Report-Final.pdf> ; American Planning Association, 2013, ; Green Infrastructure: A Landscape Approach (PAS Report 571), 2013, (164 pp) <https://www.planning.org/publications/report/9026895/>.