



Proposal Summary: Over the past two years a collaborative group of educators and scientists has developed and piloted PlanetNYC, an innovative climate science education program for undergraduate and high school students in New York City.¹ PlanetNYC is a research and teaching infrastructure that builds on NASA climate science to support social and public health research about the effects of climate change on New York's communities. The project stimulates engagement in climate science by enabling students to create evidence-based scenarios for specific NYC neighborhoods at risk for storm surge, heat effects, and other environmental impacts associated with climate change. Over the course of this 12-month project students will contribute to the creation of a master map of New York City that includes and portrays the growing body of knowledge on how climate change will impact each neighborhood in NYC. PlanetNYC is scalable from the neighborhood to the borough, watershed, and regional levels, and is replicable in other cities. This application requests \$150,000 to conduct a rigorous 12 month demonstration and evaluation of PlanetNYC with a committed and outstanding team of climate scientists and educators at key academic institutions in NYC, starting June 1, 2009, that can serve as a proof of principal and support wider dissemination of this highly valuable educational tool.

What Educational Needs are addressed by PlanetNYC? PlanetNYC addresses two key educational needs: **1) Student Engagement;** and **2) Access to scholarship, data, and tools.**
Student Engagement: As educators we must respond to students' interests and motivations with engaging curriculum, new opportunities for active learning both within and beyond the classroom, and educational strategies and methods that can successfully demonstrate the means to engage students and begin to direct them to careers in the STEM disciplines.² High schools and colleges need to develop and implement new programs and devise new learning experiences that both inspire students early in their schooling and enable them to use their talents for playing more active roles in the many challenges posed by climate change.³ The clear need is to inspire students to make commitments to the hard work and high costs of scientific education and to support the development and application of the technical expertise required to create a new generation of students seeking solutions to the challenges of climate change. New York City's position as a large coastal city with a diverse population makes it an ideal laboratory for studying climate impacts at the neighborhood scale. PlanetNYC connects climate science to students' own neighborhoods to make an abstract problem more concrete and enable students to understand linkages between climate and society. Through 1) active engagement with cutting-edge environmental and climate research using new science and education technologies; 2) mentorship from local scientists; and 3) opportunities to make meaningful research contributions students both become literate in climate sciences and motivated to pursue careers in climate science and public policy.

Access: Our educational programs and investments must support the creation of new leaders of environmental science and public policy -- citizens who are literate in the vocabulary and data of climate science and who recognize that both better science and policy are needed to anticipate and minimize the negative impacts of climate change on our society. That can only happen with access to the necessary scholarship, data and tools. At present, educators who wish to engage students on climate change lack an accessible portal for obtaining datasets needed to analyze links between climate projections, physical infrastructure, and socioeconomic impacts. This project would provide that portal, and also give students an opportunity to overlay their original research on existing datasets. Moreover, the political



and social dimensions of climate change must be interwoven with science to construct effective scientific and educational approaches to mitigation of and adaptation to climate change. In our pilot work we have seen that by providing high school and undergraduate students with exposure to highly experienced scholars and educators, PlanetNYC leads to meaningful contributions to students' climate science awareness and literacy that are relevant to their own communities. It also prepares these students to play a stronger future role through their own educational preparation and career choices.

How will PlanetNYC use NASA resources to meet these Educational Needs? PlanetNYC will use NASA resources to meet these educational needs as follows: **Student Engagement.** In the classroom and in the field, PlanetNYC's students actively utilize applications and exercises that employ real data and explore its implications for real communities. The PlanetNYC template steps students through data compilation, assembly, mapping, and analysis -- enabling them to create empirically derived climate change impact scenarios for each community of NYC.

Access to Scholarship, Data and Tools. PlanetNYC provides an educational platform and research template that employs a proven public health risk assessment model. The model provides an intellectual and methodological framework for students' utilization and integration of current climate science data, public health research, and issues of social and public policy using mapping, GIS tools, and incorporation of geo-referenced local data. To that end, PlanetNYC will employ NASA climate science material (and the research of other scientists and public health professionals collaborating on PlanetNYC) to enable students to investigate and document the climate change impacts they will face in their own communities. For example, Planet NYC will incorporate NASA-supported work at the Earth Institute's **Center for International Earth Science Information Network (CIESIN)**, where PlanetNYC geographer and GIS specialist Mark Becker is developing new uses for the Socioeconomic Data and Applications Center (SEDAC) and the Gridded Population World Survey. These NASA assets allow PlanetNYC to incorporate data from the New York City Department of Health -- where Daniel Kass, (Assistant Commissioner of the Bureau of Environmental Surveillance and Policy), Chris Goranson (Director) and Susan Resnick of the Department's GIS Program employ NASA data sets within their own well-developed mapping studies of NYC public health data, and through the work of Professor Pat Kinney, (Director of the Program in Climate Sciences at Columbia's Mailman School of Public Health), who participates in the New York Climate & Health and Cool City Projects, uses NASA remote sensing data as the basis for close examinations of urban heat and environmental pollution effects in NYC. Students also will benefit from a new mapping method developed by Prof. Juliana Maantay -- the Cadastral-based Expert Dasymeric Systems (CEDS) -- that will serve as a very high resolution base map of the NYC population and its demographic and social characteristics. These data are derived from census and other public and proprietary data sources.

In the pilot phases, undergraduate students of Professor Ernest Drucker at Columbia (students of engineering, urban planning, and architecture) and students from the CUNY Macaulay Honors College -- including the 2007 Intel Award winner -- utilized the work of Goddard Institute for Space Studies Senior Research Scientist Dr. Cynthia Rosenzweig. A storm surge map⁴ from Rosenzweig and Solecki's *Climate Change and a Global City* framed students' understanding of the potential impacts of climate change for NYC's waterside



communities (where over 400,000 people live) and served as the launching point for students' investigations. In 2007, these students developed a detailed scenario of storm surge effects for one waterside community in Brooklyn (Sunset Park) and found a minimum of 1,400 households and workplaces that provide over 30,000 jobs were at risk for flooding. This scenario was then supplemented with results of water quality monitoring of the Gowanus Canal by students from Brooklyn Technical High School, working with Dr Drucker and biologist and environmental science teacher John Cunningham. The Gowanus Canal, a potential channel for carrying polluted water from the Erie Basin into the heart of Park Slope under the conditions of storm surge, was found to have mercury levels 17 times the allowable federal limits. Subsequently (at CUNY in 2008) Honors College students developed similar scenarios for three other NYC waterside communities: Brighton Beach (Brooklyn), New Dorp (Staten Island), and Flushing/LaGuardia (Queens).

In the next phase of the program proposed under this grant, NASA science will play a central role. Dr. Cynthia Rosenzweig (Goddard Institute of Space Studies, and Columbia's Center for Climate Systems Research) will provide new scientific material, including baseline air temperature data, remotely-sensed surface temperature data derived from Landsat and Modis, and projected changes in climate based on ongoing modeling efforts. NASA funds will be used to expand the scope of climate science investigation by incorporating a wider range of variables – for example, projected changes in temperature, precipitation and sea-level rise along with updated storm surge scenarios. Data on NYC's urban heat island will also be included, allowing students to understand the difference between the impacts of local climate change (heat island effect) and global climate change, and how the two may interact. For example, local heat islands are often associated with poor air quality, a problem that may be exacerbated by global climate change. PlanetNYC's tools will be used to integrate these datasets with socioeconomic data, facilitating multi-dimensional analysis.

How will the proposed effort contribute to NASA's Education Priorities and what specific NASA education outcomes and objectives does it support? The PlanetNYC program proposed here contributes to NASA's Education Outcomes and Objectives as follows:

NASA Education Outcome 1 Higher Education – Employ and Educate: Contribute to the development of the STEM (Science, Technology, Engineering, Mathematics) workforce in disciplines needed to achieve NASA's strategic goals. PlanetNYC improves teaching and learning about global climate change in secondary schools and on college campuses with hands-on, differentiated, interdisciplinary educational programs that offer opportunities for peer-to-peer education and mentoring by and interaction with professionals working in STEM, climate science, and Earth system science disciplines inside and beyond the classroom;⁵

NASA Education Outcome 2 Elementary and Secondary Education – Educate and Engage: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty. PlanetNYC increases the number of high school and undergraduate college students using NASA Earth observation data/system models/images/research and computer technology to investigate and analyze global climate change issues.

NASA Education Objective 2.4 Student Involvement, K-12, Major Education Goal to Engage Americans in NASA's Mission: Planet NYC provides K-12 students with



authentic first-hand opportunities to participate in NASA mission activities, thus inspiring interest in STEM disciplines and careers, as well as providing opportunities for family involvement in K-12 student learning in STEM areas. PlanetNYC applies STEM disciplines to critical real world issues that capture the imagination of students, educators, and the general public -- linking NASA research with community life and increasing public science and technology literacy;

NASA Major Education Goal to Strengthen NASA & Future Workforce:

PlanetNYC offers a highly diverse student body access to global climate change education, including many of those historically underrepresented in sciences, through the participation of public college and high school students from CUNY and Brooklyn Tech, which offer merit-based admission to all, and the Columbia University Scholar's Program (CUSP) which offers significant scholarship support to minority undergraduate students;

NASA Education Objective 3: Build strategic linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission. PlanetNYC leverages strategic linkages between formal and informal education providers that PlanetNYC has built for this program over the past two years and that promote STEM literacy and careers, and awareness of NASA's mission and climate research programs. With the Columbia Center for New Media Teaching and Learning, we will design the formal assessment component to identify these dimensions of the project and evaluate how well these and other NASA education priorities, outcomes, and objectives are achieved.

Who are the collaborators in PlanetNYC?

- **Dr. Pam Factor-Litvak** (Principal Investigator), tenured Associate Professor in the Dept. of Epidemiology, Columbia University Mailman School of Public Health
- **Dr. Ernest Drucker** (Co- Principal Investigator), Professor of Epidemiology Columbia University Mailman School of Public Health, and Professor at Macaulay Honors College CUNY
- **Dr. Juliana Maantay** (Co-I Science Investigator), Director of GISc Program and Urban GISc Lab, and Assoc Professor Department of Environmental, Geographic, and Geological Sciences, Lehman College, City University of New York
- **Dr. Cynthia Rosenzweig**, Senior Research Scientist and head of the Climate Impacts Group, NASA/Goddard Institute for Space Studies, Columbia Center for Climate Systems Research
- **Mark Becker MA**, Geography, Associate Director, Geospatial Applications Division, Senior Research Associate, Center for International Earth Science Information Network (CIESIN), Columbia University, Adjunct Professor, Mailman School of Public Health, Columbia University
- **Dr. Ryan Kelsey**, Associate Director of Education and Research, Center for New Media Teaching and Learning, Columbia University
- **Randy Asher**, Principal, and **John Cunningham MS**, Biology Teacher and Environment Sciences Course Director, Brooklyn Technical High School
- **Mary Arnold**, MBA, Project Director PlanetNYC
- Associate Dean **Lavinia Lorch (PhD)**, Director, Columbia University Scholars Program
- **Daniel Kass**, Assistant Commissioner, New York City Department of Health and Mental Hygiene Bureau of Environmental Surveillance and Policy



- **Chris Goranson**, MS Director and **Susan Resnick**, Assistant Director GIS Program of the New York City Department of Health and Mental Hygiene
- **Patrick L. Kinney**, Columbia University Associate Professor of Environmental Health Sciences, Director of Program in Climate and Health, Mailman School of Public Health
- **Pyser Edelsack**, Director of Field Education at the Sophie Davis Medical School at City College CUNY. He has developed and utilized the curriculum and teaching methods for the community assessment model we employ in the climate change scenarios of NYC.

How does this program align with the goals of the Participating Entities? All of the participating entities have scientific research, educational, or public health missions, or a combination thereof, consistent with the goals of this project. The professionals participating in this grant have integrated climate/environmental science and research with education and the impacts of climate/environmental science on the urban environment and human communities in their work. PlanetNYC serves the research, teaching, and public service goals of the collaborating institutions by creating a new tool for more effective teaching of science and its application to real world problems at a critical moment, as students consider college majors, graduate education, and careers in the STEM disciplines. PlanetNYC provides a platform where neighborhood-scale student research can be connected with existing citywide research programs, offering early (and potentially transformative) experiences and resources for lifelong education in the world beyond the classroom. The careers and research programs of PlanetNYC's collaborators demonstrate models of academic and professional excellence incorporating active engagement of academic institutions in local climate change issues and how they affect communities. The program also increases the public's science literacy and addresses the broader goals for community involvement of the collaborating educational institutions -- fostering more informed, active, and effective participation by citizens in local climate change issues.

Who is the Target Audience? Planet NYC's target audience is students in New York's high schools and undergraduate colleges -- many already oriented to science -- and the schools they attend. Through PlanetNYC's program we will link these students to graduate students and faculty at Columbia and CUNY to create a conduit for the exposure of younger students to the work and thinking of more advanced students and professionals, and a mechanism for increasing the likelihood of role model formation. PlanetNYC will also involve a highly diverse body of students, providing new access to global climate change education for many of those historically underrepresented in sciences. This will be accomplished through the participation of CUNY's Honors College and Brooklyn Tech, and through Columbia's CUSP.

The Goals for PlanetNYC echo those of NASA⁶.

- Engage students in climate and Earth system science and community adaptation;
- Support NASA's science education and research career goals;
- Enhance climate science literacy;
- Utilize and leverage NASA's scientific contributions as the basis for sound climate change decision-making, climate science education, and prediction of societal climate change impacts not hitherto measured;
- Increase educational and scientific capacity for students, faculty, and communities.



What are PlanetNYC's Objectives that support Achievement of program Goals:

- Provide new opportunities for differentiated, interdisciplinary, educational experiences in climate science and STEM education for 85-110 students and associated faculty inside and beyond the classroom;
- Build e-education capabilities and technology with a public portal/space, configured for the needs of PlanetNYC's students and that supports participation in PlanetNYC by high schools and colleges, and dissemination of this technology and its research;
- Provide data sets and accessible GIS that will support more refined investigation and analysis of a wider range of climate change impacts;
- Identify and cultivate the interests of young students with genuine talents and interests in science and technology, and increase the public scientific literacy and knowledge of the important role of STEM disciplines and climate science for our future wellbeing;
- Support the development and sustainability of PlanetNYC and its student participation and partnerships through this network of collaborating institutions, and the systematic addition of in-kind, financial, and human resources devoted to PlanetNYC's goals and objectives.

What "Lessons Learned" have informed the approach? The initial PlanetNYC pilot taught us the following: 1) In the pilots, faculty had to personally manage students' access to technical material and dissemination of all work products. For example, the initial pilot applications of the community risk assessment template (at Columbia, CUNY, and Brooklyn Tech) used Gornitz's hurricane storm surge map⁴ as the starting point for inquiry and additional research into the environmental and societal implications of these geographic depictions of storm effects. This proved to be the key to engaging students and was assessed by them -- in formal course evaluations at City College -- as highly positive and successful. The pilots yielded an archive of climate change maps and complex environmental and societal impact scenarios for four NYC neighborhoods, each produced by undergraduate college students, with data input from field work. This work served as the stimulus for additional analysis by high school students of Gowanus Canal water quality monitoring. However, the personal management of student access was time consuming. 2) In the pilots, we found that some of the processes of data compilation and analysis by students were very time-consuming and data sharing by student teams with faculty and each other was restricted by the absence of a framework that could allow students and faculty to collaborate and communicate more effectively -- i.e. we recognized the need for an electronic "commons" to support PlanetNYC. With GCCE funds, these problems will be addressed through more accessible and extensive GIS information, e-education tools, a web-based medium for sharing, archiving, and publishing results, and training. GCCE funds will therefore support better project management and development capacity, and more effective and extensive participation by collaborating educational institutions, teaching faculty, and students.

What is the Project Content? How will the Goals and Objectives be achieved? What is the research base on which the program is grounded? PlanetNYC's Project Content includes three major components: **1) Science Education and Student Research; 2) E-Portfolio and Electronic Commons Development; and 3) Data Compilation and Access.** Each component is linked to a set of specific tasks and objectives:

Component 1: Science Education & Student Research: PlanetNYC provides new tools and an educational program that enhances students' access to current NASA climate science



research programs about climate effects on NYC communities. **Tasks:** Participating institutions will offer internships, research assistantships, and mentoring opportunities that allow students to work alongside faculty and more senior students. We will offer these opportunities for 60-80 high school and undergraduate college students and 25–30 graduate students. Over the summer and during the academic year all students will participate in an organized Climate Sciences curriculum to be held at participating institutions. This curriculum will consist of formal presentations, didactic classes and seminars, and student colloquia with climate science graduate students, faculty, and research professionals participating in PlanetNYC. Following the summer, student teams consisting of undergrads and high school students will take on responsibility for scientifically-based scenario projects addressing a specific climate change issue (e.g. flooding and heat effects) affecting selected communities of NYC. These projects will be reported on each month at PlanetNYC colloquia for peer, interdisciplinary, and cross-educational review. This process will both expose these students to the important ideas and findings of contemporary climate science and inspire them -- by allowing close contact with the reasoning, methods, and findings of several actual scientific enterprises that produce the NASA data and consider its applications. PlanetNYC will also enable non-science students to develop scientific literacy about the fields of climate change and public health, and enable students (and teachers) to use their work to support more informed judgments as citizens.

A critical innovation that distinguishes PlanetNYC is the use of the Cadastral-based Expert Dasymetric Systems (CEDS) maps - a very high resolution map comprised of individual property units linked to extensive population data for the NYC population.⁷ Dr Maantay and her GISc lab have developed this new mapping method and incorporated extensive social and demographic data bases that may be easily disaggregated to fit any geographic boundaries considered relevant to questions of climate science -- e.g. flood zones that cut across zip codes and political boundaries. Dr. Maantay and her laboratory will help students to populate maps of 4-6 NYC communities as the subject of student investigation during the school year. Participants will come away with the ability to superimpose their own maps and other high resolution data based on field work onto the CEDS base map -- e.g. estimates of frail elderly populations at risk for heat effects. This growing archive of student research scenarios -- linked to a point-and-click map of NYC and published on www.PlanetNYC.net -- will serve as a foundation for future students to add new neighborhood scenarios and data on climate effects -- such as habitat change that affects insect or rodent vectors, and newly-collected social survey data, e.g., local residents' knowledge and attitudes about climate effects and adaptation and mitigation strategies our students bring to their attention.

Each collaborating scientist and their institution will contribute to the curriculum and teach in it, taking interns and RAs directly into their own research programs where possible. Dr. Drucker will teach and supervise 20-30 undergraduate students (at CUNY and Columbia) and another 20- 30 high school students at Brooklyn Tech. John Cunningham will teach 20 students at Brooklyn Tech. Mark Becker will use the PlanetNYC program for his GIS course with 20-25 public health graduate students at Columbia/ Mailman). There will be four paid graduate student interns/RAs working on the project and student teams.

Component 2: E-portfolio and Electronic Commons Development: We will create new tools for educational support of PlanetNYC which will consist of two major components: A. An e-portfolio platform for each program participants' work products that has data



compilation, analysis, communications, assessment, and publishing capabilities; B. A publicly accessible portal to a master map of NYC (an “electronic commons”) that is linked to an archive of publications through www.PlanetNYC.net, our registered domain name.

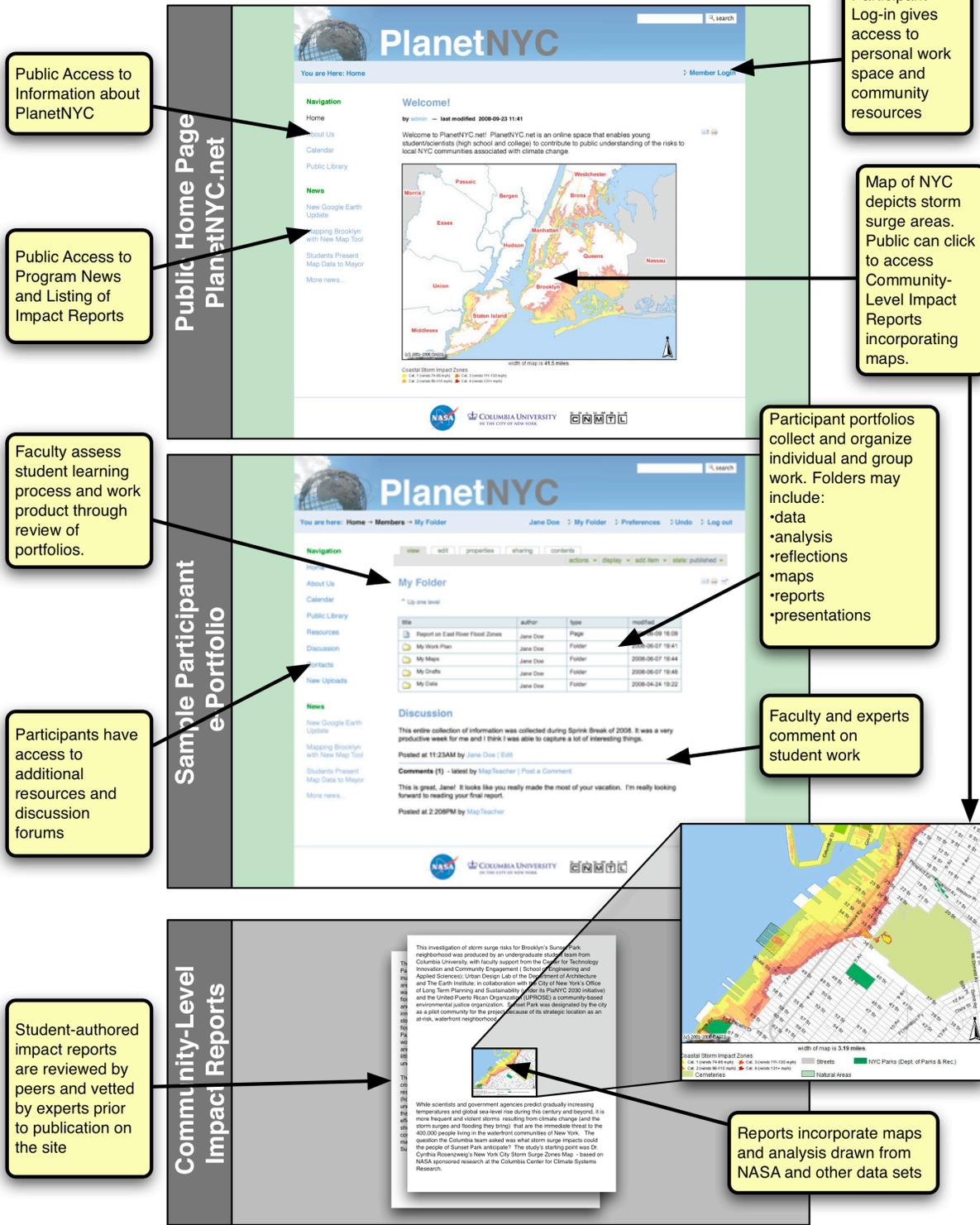
Tasks: The Columbia Center for New Media Teaching and Learning (CCNMTL) will provide professional pedagogical and e-technology support for this climate science education program as part of its *Digital Bridges Initiative* – where CCNMTL and its faculty partners experiment with innovative uses of new media and information technology. Starting in the spring semester of 2009, CCNMTL will work with Drucker, Becker, and Arnold to configure an off-the-shelf or open source web-based e-portfolio platform. Receipt of GCCE funding will enable CCNMTL to provide access to students from all participating institutions to populate the e-portfolio platform with work that is either NASA-funded or that utilizes and builds on NASA-funded research. The *e-portfolio* platform will be a fully accessible “commons” for participating students, faculty, and professionals. It also will include a public portal where the public at large can view maps of NYC’s neighborhoods linked to published, peer- and faculty-reviewed student reports on climate change impacts, the work of faculty, student photo archive, and other related materials, with reference to NASA research, data, models, and funding. The e-portfolio will facilitate data and report compilation, collaboration, social learning⁸ demonstration of achievements, public relations, and student, faculty, and program assessment -- including annual needs assessment by participating faculty and professionals to improve the program’s content and methods vis a vis the achievement of goals and objectives they have set for the program.⁹ CCNMTL also will assist in cultivating opportunities within Columbia University’s teaching faculty and other Columbia entities to recruit additional partnerships that will utilize this NASA-based climate science e-education technology.

Component 3: Data Compilation & Access: Establish PlanetNYC as a sustainable public resource that assembles and provides open access through CIESIN and the e-portfolio system to climate change data sets, maps, and other instructional materials/documentation about NYC, and supports educational efforts for secondary and undergraduate students and their teachers. **Task:** With PlanetNYC we create a new teaching and research infrastructure – with powerful new tools and a platform to facilitate access to climate science data and apply these data to local situations in NYC. Students will have access to the GIS data compiled by the Maantay team, through CIESIN, with training on that system by Columbia’s Lehman Library. In addition, through off-the-shelf or open source e-portfolio software configured for use by students and faculty participating in PlanetNYC, we provide another powerful mechanism for both archiving and publishing students’ work cumulatively, such that it can be distributed, searched, and shared by subsequent students to build upon. The goal is to fill in the master map of PlanetNYC over successive years of students’ work and link these products with student-produced information and reports on specific neighborhoods -- publicly available at www.planetnyc.net. Future generations of students will take ownership as they define and populate Planet NYC with rich data on local communities facing the impacts of climate change.

FIGURE 1 (p. 9) which follows schematically illustrates and summarizes the key elements of the content of Planet NYC as described in this proposal: 1) home page, log in, access points to content, and base map; 2) e- portfolio teaching and management tool for archiving and publishing students work and faculty comments; 3) Sunset Park example of student scenario and relation to base map.



PlanetNYC Interface Design Concept





What are the Anticipated Results of PlanetNYC? This project will serve as a proof of principal for the efficacy of using the new mapping and data systems of PlanetNYC as the central feature of an educational program in climate science with high school and college students. With a one-year trial we anticipate:

- Enhanced climate science literacy in high school and college students, greater student awareness of and interest in NASA science, and more specific and better informed student interest in careers in climate science;
- Greater understanding of NASA's scientific contributions and the ways in which these contributions may be more widely utilized and leveraged as the basis for sound climate science education, and prediction of societal climate change impacts not hitherto measured;
- Increased educational and scientific capacity in the participating institutions, and enhanced support in the area of climate change for students, faculty, schools, and communities.

What is the Timeline for Achieving stated Goals & Objectives, including Milestones?

Component 1 Task: Science Education & Student Research

Months 1–3: Milestones: I. First Iteration of e-portfolio Available for Student Use; II. NASA, CIESIN GIS, and New Data Compiled with Computerized Access by Students; III. Students Conduct Ambient Temperature Monitoring for NYCDOH; IV. Monitoring and Data Teams include High School, Undergraduate, Grad Students; V. Students Peer-Reviewed Work Published on PlanetNYC.net; VI. First Collaborators' Team Meeting.

Tasks: A. Registration & Orientation; B. GIS Intro. at Columbia Lehman Library; C. Student Assignments: 1. Maantay Data Compilation & Access Team; 2. Brooklyn H.S. Field Work Team; 3. E-portfolio Development Team; D. Monthly Student Convocations with Student & Faculty Presentations, Manual Evaluation for student summer projects; E. Final student projects presented to communities, published in PlanetNYC.net, F. Final Evaluations by students, faculty, professionals & Program Needs Assessment.

Months 4-7: Milestones: I. Students Peer-Reviewed Work Published on PlanetNYC.net, II. NASA and GIS Data Compiled with Computerized Access by Students; III. Second Collaborators' Team Meeting. **Tasks:** A. Registration & Orientation; B. GIS Intro. at Columbia Lehman Library; C. Student Assignments: 1. Neighborhood Climate Change Scenario Development Teams; 2. Brooklyn H.S. Field Work Team; 3. Maantay Data Compilation & Access Team; D. Monthly Student Convocations with Student & Faculty Presentations, E. E-portfolio Evaluation; F. Final projects presented to communities; G. Student projects published on www.PlanetNYC.net, H. Final Evaluations by students, faculty, professionals & Program Needs Assessment.

Months 8-12: Milestones: I. Students Peer-Reviewed Work Published on PlanetNYC.net; II. NASA and GIS Data Compiled with Computerized Access by Students; III. Third Collaborators' Team Meeting **Tasks:** A. Registration & Orientation; B. GIS Intro. at Columbia Lehman Library; C. Student Assignments: 1. Neighborhood Climate Change Scenario Development Teams; 2. Brooklyn H.S. Field Work Team; 3. Becker GIS Course, Mailman School of Public Health; 4. Drucker Future of New York Course, CUNY; 5. Maantay Data Compilation & Access Team; D. Monthly Student Convocations with Student & Faculty Presentations, E. E-portfolio Evaluation; F. Final projects presented to communities, published on www.PlanetNYC.net; G. Final Evaluations by students, faculty, professionals & Program Needs Assessment; H. Final Report to NASA.



Component 2 Task: E-portfolio Development: Months 1–3: Milestones: I. CCNMTL e-portfolio System Rollout; **Months 4-7: Milestones:** I. First publication of student reports on www.PlanetNYC.net; **Months 8-12: Milestones:** I. Needs Assessment for Second Iteration of e-portfolio

Component 3 Task: Data Compilation & Access: Months 1–3: Milestones: I. NASA/GISS, CEDS, CIESIN/SEDAC, NYCDOH Data Sets, Mapping Compiled at CIESIN; **Months 4 – 7: Milestones:** I. NASA/GISS, CEDS, CIESIN/SEDAC, NYCDOH Data Sets, Mapping Compiled at CIESIN; **Months 8 – 12: Milestones:** I. NASA/GISS, CEDS, CIESIN/SEDAC, NYCDOH Data Sets, Mapping Compiled at CIESIN

How will PlanetNYC.net be Sustained beyond the funding period? PlanetNYC will build a sustainable research and educational platform at Columbia, CUNY, and Brooklyn Tech - each of which is already strongly committed to climate sciences education and to direct engagement with the critical climate issues faced by NYC. The new GIS data will become part of CIESIN and Lehman Library's collection, which students will be trained to access and use in future research. In addition to its links to the many research and teaching programs in place and planned at Columbia and CUNY, PlanetNYC is an excellent adjunct to the climate change concerns of New Yorkers¹⁰, and to NYC Mayor Michael R. Bloomberg's recently launched *Climate Change Adaptation Task Force* and the *New York City Panel on Climate Change* – mandated to develop adaptation strategies to secure the City's infrastructure from the effects of climate change.¹¹ The Panel is to be co-chaired by Prof. Cynthia Rosenzweig – a participant in this NASA grant. The project also is being institutionalized at Brooklyn Tech, the largest science high school in the US - where the principal and science faculty coordinator are working closely with the alumni association which is committed to providing stipend support for Tech students participating in PlanetNYC's summer program. Tech is also spearheading a curriculum development committee based on PlanetNYC that will support Tech's key role in city-wide and regional science education leadership and innovation.

In addition, our e-portfolio system will support PlanetNYC's sustainability by providing an archival record of the program's progress over time and a solid foundation for needs assessment by faculty and professional participants on an ongoing basis. Needs assessment results will feed back into program enhancements, annual goal- and objective-setting, and plans for the future by participants. NASA can be assured that in NYC we will be able to leverage NASA support for PlanetNYC to apply for and receive additional funding and support to expand the e-portfolio and other aspects of the program for the period following NASA funding. PlanetNYC is sustainable, scalable, and replicable in other localities. Brooklyn Tech personnel engaged in PlanetNYC will ensure that other special education schools in NYC and the wider northeast region, as well as science teachers, learn how they can use PlanetNYC's technologies for their students. The partners already are discussing additional funding applications for aspects of PlanetNYC.

What is the Dissemination Plan Outline? PlanetNYC is inherently a tool for publishing and disseminating its content, as well as for built-in public relations and promotion of the projects' work. The e-portfolio evaluation system we will employ has an educational platform and server within the Columbia Center for New Media Teaching and Learning, an entity of the university's Information Services organization, a GIS educational platform at CIESIN, Columbia's Lehman Library, and the GISc Lab at CUNY Lehman College.



Through the e-portfolio system, collaborators, faculty, and each student will have password access to instructional materials, a folder for individual and collaborative work, and evaluation and communications capabilities. When student work has been completed, evaluated, and peer-reviewed, it will be presented in the monthly student colloquia and disseminated -- through the www.planetnyc.net public portal/NYC map. Downloadable GIS data layers will be furnished through CIESIN. CCNMTL will feature the program on its web page and demo it for Columbia faculty as part of its Digital Bridges Initiative for the creation and dissemination of new media methods in pedagogy already underway at Columbia and Teachers College. Brooklyn Tech will disseminate PlanetNYC information and training through the school's \$1.1M computer lab – which provides e-education for teachers and students, its website, in communications to students and parents, and in meetings and presentations to special education secondary schools within and beyond the NYC Metro area, where Tech also has a leadership position in science and educational organizations, e.g., Science Council of NYC (SCONYC), the New York Biology Teachers' Association, and the National Association of Special Education Schools.

What is the Evaluation Plan for Measuring Project Success? The following evaluation criteria and pre- and post-PlanetNYC questionnaires for participating students (addressing knowledge and attitudes about climate change and climate sciences) will be incorporated into the e-portfolio system. With guidance and support from CCNMTL, the participating professionals will develop weighted evaluation criteria (rubrics) to measure PlanetNYC's success by:

Program Evaluation Measures:

- Whether the e-portfolio platform adequately supported the needs of the program;
- Development of the master map of NYC; publishing student work on the worldwide web;
- The engagement of all the partner schools and agencies;
- Quality and outcomes of student-to-student and faculty-to-student mentoring;
- Engagement of additional partner schools, courses, faculty.

Learning Outcome Measures:

- Increased student awareness of climate change research and community impacts;
- Increased student knowledge of /interest in careers in science, STEM disciplines;
- The quality of individual student work;
- Quality and outcomes of student-to-student and faculty-to-student mentoring.

The e-portfolio platform supports the Portfolio Assessment system for evaluating students' work because it includes methodologies to assess success and needs over time. Portfolio Assessment accommodates the complex nature of the understanding, methodologies, and technologies employed by students and faculty and the program's anticipated growth trajectory. It offers a flexible fit for this program's evolving technologies, timeframe, and range of work products.

What are roles and responsibilities of team members in development and execution of PlanetNYC.net?

Columbia University: Mailman School of Public Health

- **P. Factor-Litvak,**³⁹⁻⁴⁵ **PI:** Oversight of administration and adherence to proposed plans, timetable, and budget.



- **E Drucker¹²⁻¹³, Co PI:** Coordination of teaching program, seminars, and colloquia; direct teaching of PlanetNYC; student mentoring at Columbia, CUNY, Brooklyn Tech.
- **M Becker¹⁴⁻¹⁵:** Responsible for NASA SEDAC population data methods and content; linkages to CEDS maps and supervision of RA programmer; integration of PlanetNYC into GIS teaching at Mailman; integration of new GIS data into existing CIESIN and Lehman Library systems.
- **M Arnold¹⁶:** Project management and administration of student program, including coordination and scheduling, development and oversight of e-portfolio evaluation system, building PlanetNYC.net, GIS database; new grant writing/development.

CCNMTL: Kelsey¹⁷: Oversight of selection, configuration, development, hosting of e-portfolio system; design of user interface, collection of data on user access and utilization.

GISS /CCRS: Rosenzweig¹⁸⁻¹⁹ will oversee the addition of Landsat, Modis data, models, and maps to the GIS database.

CU Scholars Program: Lorch: Student recruitment, participation in design and evaluation of educational program mentorship of HS students, leadership models and individual research internships with PlanetNYC.net faculty and scientists.

City University of New York

- **Lehman College: Maantay²⁰⁻²⁸:** Supervision of adaptation of CEDS maps and integration with to SEDAC research (with Becker), GISS & CCRS research (with Rosenzweig), NYCDOH (with Kass, Goranson, Resnick), supervision of programmers and RAs involved in this work, teaching of students in GIS methods and research applications to climate change.
- **Macaulay Honors College: Drucker:** Teaching Honors Course in Public Health and Climate Change that will employ Planet NYC.
- Expansion of the PlanetNYC program to undergraduate courses at Lehman College and Lehman College High School.
- Presentations to student colloquia: Maantay, Drucker, Edelsack.

New York City Department of Health and Mental Hygiene

- **Kass²⁹⁻³¹:** Teaching/Mentoring: NYCDOH will have a graduate student working on this project through the Department's Health Research Training Program.
- **Goranson, Resnick:** GIS, Surveillance: Incorporating DOH data and maps and generating new data through PlanetNYC.net.

Brooklyn Technical High School

- **John Cunningham¹:** Teaching/Mentoring/Presentation at student colloquia; responsible for teaching Environmental Sciences course at Tech; selection and oversight of Tech students; has designed and will teach the environmental science curriculum at Tech.
- **Randy Asher, Principal:** Provision of school facilities for summer programs, including classrooms and the school's state-of-the-art computer and water quality testing labs; formation of a corps of faculty, alumni, and the Brooklyn Tech Alumni Foundation, Inc. to support curriculum development, faculty training, teaching of PlanetNYC.net.



What is the demonstrated effectiveness of prior support in global climate change and Earth system science education, past experience of the proposing team? The proposing team consists of accomplished academics and professionals in climate sciences, public health, urban studies, science education, and urban conservation: (further individual details are available in budget **justification** and references sections)

Proposing Team

- **Dr. Pam Factor-Litvak**, Principal Investigator. Dr. Factor-Litvak is tenured Associate Professor in the Dept. of Epidemiology, Columbia U. Mailman School of Public Health.
- **Dr. Ernest Drucker**. Co- Principal Investigator. Internationally recognized public health educator and researcher and founder of PlanetNYC. He has developed and taught high school students and undergraduates at CUNY and Columbia for over 3 years using this model and curriculum.
- **Dr. Juliana Maantay**. Science Principal Investigator. Has worked under NOAA cooperative grants, at the Center for Remote Sensing Science and Technology (CREST), using GIS and remote sensing to develop predictive models studying “The Geography of Asthma and Air Pollution in the Bronx”; “the Characterization of Habitats Predicting West Nile Virus Risk in New York State”; and the Feature Identification Project to create a comprehensive spatial and attribute database of New York City parks.
- **Dr. Cynthia Rosenzweig**. Senior Consultant. Senior Research Scientist at NASA’s Goddard Institute for Space Studies where she heads the Climate Impacts Group, has organized and led large-scale interdisciplinary regional, national, and international studies of climate change impacts and adaptation. She co-led the Metropolitan East Coast Regional Assessment of the U.S. National Assessment of the Potential Consequences of Climate Variability and Change, sponsored by the U.S. Global Change Research Program. She is a Professor of Environmental Science at Barnard College, Senior Research Scientist at the Columbia Earth Institute, and co-chair of the Mayor’s newly formed New York City Panel on Climate Change.
- **Dr. Ryan Kelsey**. Director of Evaluation. Director of Education at the Columbia Center for New Media Teaching and Learning. Created Global Classroom (with the Earth Institute, Columbia University) for development of curriculum and pedagogy for web-based systems, organizing and delivering lectures and readings for a master’s level, sustainable development course simultaneously taught at a dozen universities around the world ([Global Classroom information](#) 2008); and led the creation of Brownfield Action, a simulation to support Barnard’s Introduction to Environmental Science course (funded by NSF).
- **Mark Becker**. Senior Faculty. GIS specialist at Columbia’s Center for Earth Science Information Network/[Socioeconomic Data and Applications Center](#), Principal Investigator for the USGS NBII Northeast Node and Administrator for the ESRI University Site License for Columbia University, where he created an Environmental Sustainability distance-learning module. He has New Jersey Certification in Secondary Education and is an SRI Authorized Instructor; ArcView 3.2, ArcGIS 9.x parts 1 & 2, Migrating to ArcGIS. MA in Geography from Hunter College, CUNY.



- **John Cunningham.** High School Program coordinator). Developed Brooklyn Tech's environmental and water quality monitoring laboratory for the use of PlanetNYC by high school students at Brooklyn Tech.
- **Mary Arnold,** Project Director of Planet NYC. Has led the start up and development of community-based environmental and community sustainability projects for 20 years. Projects include recycling a 46-acre landfill into a new county park, preserving 8,400 acres of wetlands, and establishing an inter-municipal watershed association dedicated to protecting drinking water for 1.2 million people. MBA from Boston University.
- **Daniel Kass.** Assistant Commissioner of the Bureau of Environmental Surveillance and Policy (BESP) which reviews and analyzes scientific and administrative data for the purpose of improving the health of all New Yorkers; includes Environmental Public Health Tracking: BESP receives funding from the Centers for Disease Control and Prevention to participate in a National Network for tracking environmental hazards, exposures, and health outcomes.
- **Chris Goranson MS and Susan Resnick MPH.** Respectively Director and Assistant Director of the GIS Center at the NYC Department of Health and Mental Hygiene. Goranson heads the office and has taught GIS at Columbia. Resnick teaches GIS in Public Health for Mt Sinai School of Medicine's Public Health program, and both frequently teach GIS workshops within the Department of Health.
- **Lavinia Lorch (PhD),** is Associate Dean, Director, Columbia University Scholars Program.
- **Pyser Edelsack.** Director of Field Education at the Sophie Davis Medical School at City College CUNY. He has developed and utilized the curriculum and teaching methods for the community assessment model we employ in the climate change scenarios of NYC.
- **Dr. Pat Kinney³²⁻³⁸,** Associate Professor of Environmental Health Sciences and Director of the Program in Climate and Health at Columbia, Mailman School of Public Health. He has done extensive research on environmental pollution effects and public health, with his most recent work and publications addressing the issues of urban heat island effects in NYC.