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Community-empowered adaptation for self-reliance

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This paper describes the integration of social–ecological science with traditional knowledge to address global-change challenges faced by indigenous communities in rural Alaska. The Community Partnership for Self-Reliance is a novel boundary organization that uses community visions for self-reliance, based on local and traditional knowledge, to link bottom-up with top-down adaptation planning. We suggest that similar boundary strategies can improve the communication of adaptation needs and opportunities across scales, empowering local communities to select adaptation choices that fit their own goals. This would facilitate regional experimentation and diffusion of innovative solutions to address rapid and heterogeneous environmental and socioeconomic change.

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Introduction and approach

Given the accelerating pace of global environmental and social change [1], identification of a vision and process for adaptation (defined here as action that enhances long-term wellbeing and sustainability) is critical if households, communities, and nations are to thrive [2,3]. Government adaptation programs often focus on specific stresses (e.g., climate change or renewable energy) in isolation, sometimes leading to unintended consequences [4]. In contrast, real-world problems are inherently transdisciplinary, that is, they require insights not only from natural and social scientists but also from practitioners seeking solutions and from communities that are affected by problems and attempted solutions.

A fundamental limitation of top-down planning is that external planners provide intended solutions that may not be closely informed by community visions for the future. This creates an inevitable tension between top-down government planning, which focuses on cost-effective provision of a few broadly applicable solutions, and local empowerment to identify locally appropriate adaptation goals and pathways [2,5]. This dilemma suggests a need for community-empowered adaptation planning and more effective integration of bottom-up and top-down planning, monitoring, and assessment to link government expertise and resources with local knowledge of adaptation history and opportunities [6,7].

In 2011 the Community Partnership for Self-Reliance (CPS) was initiated in response to Native leader Larry Merculieff's challenge to foster university research that addressed the priorities of Alaska Native communities rather than only those of individual researchers. CPS began as a collaboration of the Alaska Native Science Commission (ANSC; a tribal NGO), the University of Alaska Fairbanks (UAF), and selected rural Alaska communities. Over two years, a working group, chaired by Merculieff and composed of 13 Alaska Native leaders, 5 UAF faculty, and 3 graduate students, co-designed CPS to link community visions for self-reliance with technical expertise through *inreach* from communities to the university and agencies. We define inreach as the process by which communities tap technical expertise to address community-defined barriers to their long-term self-reliance. Native leaders in the working group identified eleven rural communities that were highly innovative and lacked local economic opportunities or road access to jobs. These communities were invited to apply to participate in CPS. Four communities applied and were accepted into CPS. The goal of the program is to foster bottom-up adaptation planning in rural Alaska that prioritizes local sustainability visions, assesses the feasibility of adaptation options, and formulates a strategy for transformative adaptive changes, that is, changes that empower communities to address their own long-term sustainability goals.

We identified twenty UAF research groups willing to provide their expertise, if requested by communities.

Most of these groups had no experience working with communities but felt that their research was, or could be, community-relevant. Their expertise included energy, housing, water systems, rural development, business, indigenous languages, education, ecology, agriculture, wildlife and fisheries, resource management, health, climate science, and climate policy.

The CPS team engaging with each community consisted of two ANSC leaders, one UAF graduate student (a different student for each community), and one-to-three UAF faculty members. The self-reliance priorities identified by each community in their applications to CPS were revised during three CPS visits to each community over a 6-month period. At the initial CPS meeting with a community's tribal council and in community-wide meetings, ANSC leaders explained the goals of CPS. They presented a scenario of continued increases in the cost of fuel and other commercial goods and a decline in services provided by funding-constrained government agencies, which together would require greater community self-reliance to solve their own problems. ANSC made available a written survey by which each community could assess its cultural strengths. During the first 1–2 CPS visits to each community, tribal leaders articulated and prioritized one-to-three sustainability issues that they believed most strongly constrained the self-reliance of their community. Based on discussions of UAF expertise relevant to these issues, tribal-council leaders chose the issues on which they wished to collaborate with UAF researchers. See Supplementary Information for detailed methods and community descriptions.

Findings

Community characteristics and adaptation challenges

The four communities that participated in CPS (Igiugig, Koyukuk, Newtok, and Nikolai) were representative of Alaska rural communities with respect to their lack of connection to the road system and electricity grid, their predominantly indigenous population (72–99%), high unemployment (50–58%), substantial poverty (29–55% of the population below the US poverty line; 6-fold higher than in Anchorage [Alaska's largest city]), and extensive nutritional and cultural dependence on subsistence hunting and fishing (Table 1). Compared to Anchorage, average costs in these villages were 1.9 times higher for fuel and 2.4 times higher for electricity and commercial goods, whereas median household income, with the exception of Newtok, was about 30% of that in Anchorage.

Table 1

General characteristics of CPS communities.

Parameter[a]	Igiugig	Koyukuk	Newtok	Nikolai
Latitude, longitude	60°N, 156°W	65°N, 158°W	61°N, 165°W	63°N, 154°W
Complexity of local government[b]	Tr, VC	Tr, Ci, VC	Tr, VC	Tr, Ci, VC
Population[a]	52	95	377	94
AK Native (% non-white)	72%	99%	96%	92%
Ethnic majority	Yup'ik	Athabascan	Yup'ik	Athabascan
Flight minutes to urban center[c]	A, 80	F, 150	A, 240	A, 90
Water source[d]	R, W	W	L	W
Sewage syst. (% of occupied homes)	88%	0%	0%	100%
# students in school (% of pop.)[a]	19 (37%)	15 (16%)	155 (41%)	11 (12%)
School language program? (Y/N)	Y	Y	Y	N
Culture camp? (Y/N)	Y	Y	Y	Y
Housing units occupied (% of total)	84%	78%	97%	77%
People per occupied house	4.0	2.4	5.3	2.7
Unemployment[a] (% of workers not in labor force)	50%	53%	58%	53%
% of jobs in public sector	67%	56%	28%	53%
Median household income[a]	$14 423	$19 583	$43 056	$15 000
% households below US poverty line[a]	42%	55%	29%	55%
Electricity cost[a] ($/kwh)				
Actual cost	$.81	$.95	$.80	$.90
Subsidized cost to residents	$.28	$.55	$.24	$.25
Heating fuel cost[a] ($/gal)	$7.79	$6.50	$6.75	$8.00
Subsist harvest (lb per household)[e]	1716	NA	NA	2902
Subsistence use (% of households)	100%	100%	100%	100%
2100 warming (Dec, Jan)[f]	9.4 °C	9.4 °C	8.9 °C	7.8 °C

[a] Alaska Community database, 2011 and 2012 information from communities.
[b] Tr: tribal council, Ci: city government, VC: Village corporation.
[c] Anchorage (A); Fairbanks (F).
[d] Water source: R: River; L: lake; W: Wells.
[e] NA (no data available).
[f] Projected increase in 2100 relative to 1960–2000 (http://www.snap.uaf.edu/).