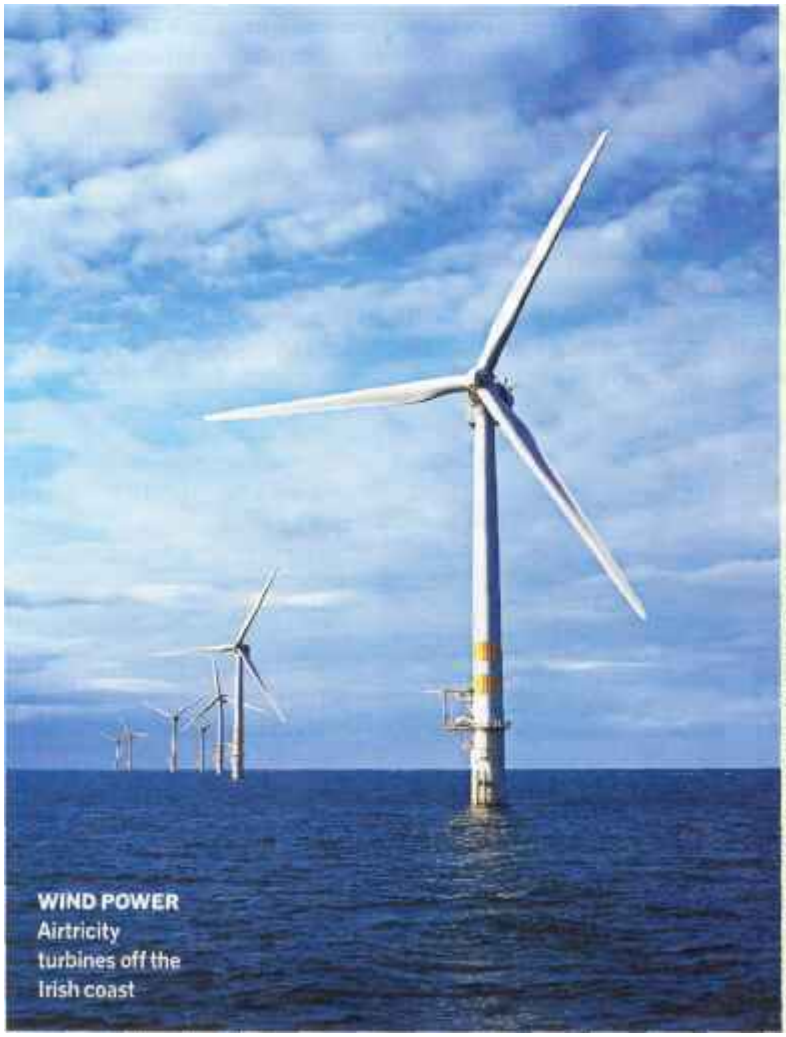
FROM THE FRONTIERS OF INNOVATION

BUSINESS 2.0

[Problem-Solving]

GO GREEN. GET RICH.

Think humanity's problems are too big to be tackled by business? Think again. Here are seven companies showing **how we can make millions saving us from ourselves.**



WIND POWER Airtricity turbines off the Irish coast

COURTESY AIRTRICITY; INSET, COURTESY ABB POWER TECHNOLOGIES

IF YOU'VE READ the news lately, you know the scale of the problem. Catastrophes that once seemed far away are creeping uncomfortably close to our lifetimes. The permanent polar ice cap will disappear by 2040. The seas could be practically devoid of fish by 2048. Manhattan and Miami will be flooded by 2050. Add in widespread disease and famine, and you have a script for the apocalypse. But before you get too depressed, consider that business—until now part of the problem—is scrambling for answers. Clean-technology investments soared by more than 50% in the first three quarters of 2006. And venture capital giant Kleiner Perkins Caufield & Byers has announced a doubling of its renewable-energy fund, to $200 million. Kleiner partner Ray Lane told the *Wall Street Journal* that clean tech will be "bigger than the Internet, by an order of magnitude."

For the following stories, we identified the most intractable problems facing the human race. Beyond climate change, there are the pollution troubles: mountains of trash, haze-choked skies, and dirty water.

PROBLEM NO. 1: GLOBAL WARMING

Airtricity has plans to **overthrow global warming's biggest culprit**—power plants—with a sea of wind turbines.

THE BACKGROUND Carbon dioxide makes up nearly 80% of all greenhouse gases. More than a quarter of that CO_2 comes from electrical power plants. That's why replacing plants that run on fossil fuels like coal, oil, and natural gas with renewable power sources, even nukes, has emerged as a major plank in the campaign against global warming. The effort is heightened in Europe because the continent relies on fuel imports from Russia and the Middle East for 50% of its energy, and a recent projection shows that portion increasing to 70% by 2025.

THE SOLUTION Emission-free nuclear power is enjoying a renaissance in China and India, but worries about radioactive-waste storage and terrorist attacks have kept it in check elsewhere. That's helped open the door for wind power—which is gaining momentum thanks to recent breakthroughs in turbine and transmission technology and because it's 70% cheaper to generate than solar power. In May, Dublin-based Airtricity, the world's fastest-growing wind-power developer, announced plans for a European supergrid—a network of 2,000 offshore wind turbines in the North Atlantic. The grid would initially supply 10,000 megawatts to eight million homes. Ultimately, Airtricity envisions a wind grid stretching from Spain to Sweden, with an output equal to that of 30 nuclear reactors. The supergrid wouldn't eliminate the CO_2 thrown off by Europe's power plants, but it would reduce it by 60 million tons a year—the equivalent of taking 15 million cars off the road.

"THERE'S A FORTUNE TO BE MADE HERE," SAYS CEO O'CONNOR.

THE PAYOFF Founded just seven years ago, Airtricity is on track to bring in $657 million in annual revenue by 2010. The company currently operates 16 wind farms in the U.S., Britain, and Ireland, and its five-year project timeline will ramp it up to a potential 7,000 megawatts in capacity, equal to the output of 14 U.S. coal plants. If any of its grid projects get to completion, even if Airtricity is only a minority partner, says Harvard Business School professor Richard Victor, the company will be catapulted into the ranks of the world's top green-energy players. "There's a fortune to be made here," says Airtricity CEO Eddie O'Connor. Airtricity already has a team pushing plans for an even larger supergrid of one million megawatts to be based across the Great Plains states.

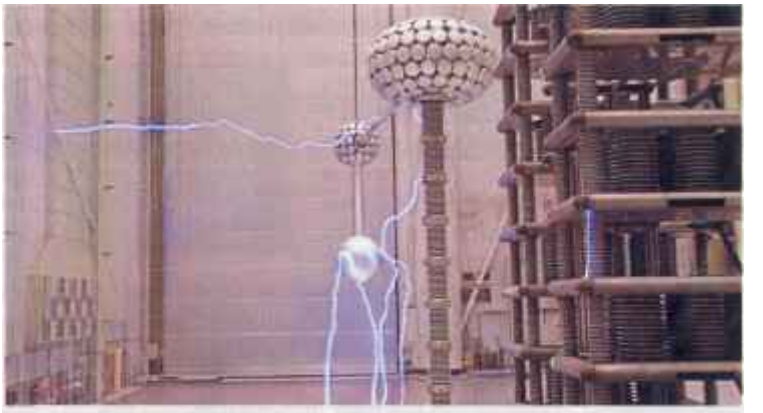
THE OPPORTUNITY Airtricity estimates that the first stage of the European supergrid will cost more than $25 billion over ten years, and the company is lobbying for government approvals. But there's no shortage of opportunity for hundreds of other wind producers to start banding together, since scale is what's needed most to lift wind out of the "alternative" market. European governments are discussing whether to pour additional tens of billions of dollars into building green-energy infrastructure. Says Bo Normark, vice president of transmission technology supplier ABB: "Whether they're Airtricity's or not, projects based on this concept will be built by someone and will likely be in operation by 2012." —*PaulKaihla*

THE BIGGEST PROBLEMS

1. GLOBAL WARMING
2. HUNGER AND MALNUTRITION
3. WASTE DISPOSAL
4. DIRTY WATER
5. DIRTY AIR
6. EPIDEMICS
7. OVERFISHING

Disease includes not just viral epidemics but also new strains of ultra-resistant bacteria. And our global food problem isn't just about Third World famine; it's also about conditions that could wipe out the $158 billion fishing industry.

It made for a disquieting list—until we found companies developing workable, scalable solutions. For each, we teased out not just the size of the potential windfall but also entrepreneurial insights from the pioneers. And we found lots of technologies on the horizon, still too new to be commercialized, that could emerge in just a few years . Our most disastrous century yet? Maybe. It could also be our finest hour. —*Chris Taylor*



A NEEDED JOLT Recent advances in high-voltage transformers—shown here in a two-million-volt test—will help wind turbines link up over long distances.

PROBLEM NO. 2: HUNGER AND MALNUTRITION

Nutriset is **attacking a huge problem** with a surprisingly small product.

HEALTHY BUSINESS Nutriset's Lescanne partners with communities to produce Plumpy'nut with local ingredients.

THE BACKGROUND More than 850 million people live in a state of hunger. Malnutrition kills more people annually than AIDS, malaria, and tuberculosis combined. The majority of the hungry live in the developing world, especially in India and sub-Saharan Africa. Children suffer disproportionately: The United Nations says a child dies from the complications of malnutrition every five seconds. Bleakest of all, the number of humans enduring famine has not changed as the rest of the world has grown richer and the food supply more plentiful.

THE SOLUTION Nutriset, a private company in France founded by former African aid worker Michel Lescanne, has been selling food products to combat hunger and malnutrition since 1986. And it finally has a hit on its hands. Plumpy'nut, a patented nutritional supplement, was distributed to an estimated 500,000 children last year—double the number in 2005 and up from just 120,000 in 2004. One three-ounce packet delivers 500 calories. Severely malnourished children can thrive on three or four a day. Similar to Nutella, the chocolate-hazelnut spread popular in Europe, Plumpy'nut is a thick brown paste made from ground peanuts, sugar, and powdered milk, fortified with vitamins and minerals. Unlike traditional aid products like powdered-milk supplements, which require clean water and refrigeration or trained aid workers to administer them, Plumpy'nut isn't perishable and travels easily.

MORE THAN 850 MILLION PEOPLE LIVE IN A STATE OF HUNGER.

THE PAYOFF Orders from big buyers like Unicef helped Nutriset's sales top $25 million in 2006, up from $6.5 million in 2001. Most entrepreneurs would crow about such growth, but not company director Adeline Lescanne. "We don't want to be a multinational," she says. "We want to produce all that is needed. If we have to grow, we will grow to satisfy need." She says Nutriset reinvests 80% of its profit—or about $2.5 million during the past year—into developing new products, and the firm is partnering with entrepreneurs in the Democratic Republic of the Congo, Ethiopia, Malawi, and Niger to produce Plumpy'nut locally. Each African franchisee will be a for-profit entity that relies on less expensive local ingredients to deliver Nutriset's proprietary recipe.

THE OPPORTUNITY With no direct competitors and so many hungry people on the planet, Nutriset's future growth looks certain. Would-be social entrepreneurs should remember the lesson of Nobel laureate Muhammad Yunus's micro-finance bank: Sometimes the best solution to a big problem is a small one—in this case, one that fits in the palm of a child's hand. —*CarleenHawn*

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PROBLEM NO. 3: WASTE DISPOSAL

A Canadian company, PyroGenesis, has perfected the **ultimate recycling machine:** a superheating furnace that reduces trash to valuable raw materials.

THE BACKGROUND We're building bigger and bigger mountains of increasingly toxic garbage. The U.S. alone annually produces 1.4 billion tons of waste, the majority of which winds up in landfills. Recycling is a noble goal, but not everything can be recycled, and many places lack the infrastructure for it anyway. Incinerators can reduce the volume of trash, but they emit dioxins and toxic ash, which contaminate the water table. And while newer systems can trap both in filters, those filters then require costly disposal techniques.

THE SOLUTION Montreal-based PyroGenesis has refined a process, called plasma arc gasification, in which solid waste is shredded and fed into a furnace where extreme electrical charges bring the temperature above 3,000 degrees. After an hour or so, waste material breaks down into its molecular building blocks, leaving three marketable byproducts: a combustible synthesis gas, or syngas, that can be converted into steam or electricity; metal ingots that can be resold and melted down again; and a glassy solid that can be processed into material for floor tiles or gravel. Plasma furnaces can safely handle factory and hospital waste, hazardous runoff, and even the oil sludge that comes off ships.

The basic technology is not new; torches were used by NASA scientists in the 1960s to test heat shields on Apollo command modules. PyroGenesis was one of the first companies to try to scale the method for widespread industrial use.

§ THE PAYOFF With clean-tech investment booming, big clients have started knocking. Carnival, the $11 billion crime-shin operatnr uses a PyroGenesis system to reduce five tons a day of cabin waste and food on one of its vessels to a few pounds of harmless sand. The U.S. Navy has hired PyroGenesis to develop plasma waste systems for new aircraft carriers due out in 2015. PyroGenesis recently sold an industrial system to the University of Athens for about $1 million and is developing 25-, 50-, and 100-ton systems that will sell for as much as $25 million apiece.

THE OPPORTUNITY The long-term market opportunity is immense: An estimated $40 billion is spent annually to transport, incinerate, recycle, and store waste in the U.S. alone.

Although several small waste facilities in Japan use plasma-gas furnaces to incinerate their trash, most industry experts predict that the technology is still several years away from widespread commercial use. Dozens of early-stage startups, meanwhile, have been busy developing related products in niche markets for medical and other hazardous wastes. —*Sidra Durst*

PACKING HEAT CEO Peter Pascal! holds a plasma torch, which filters toxins from a supercharged furnace that produces usable byproducts (top).

GARBAGE IN, DOLLARS OUT

How PyroGenesis's recycling machine works:

Giant spinning blades grind waste into tiny bits.

Electrical charges heat itto 3,000 degrees.

The system separates the three marketable byproducts.

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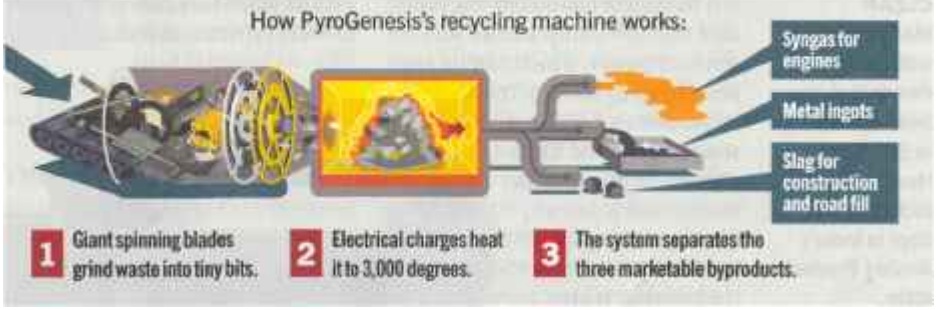


PROBLEM NO. 4: DIRTY WATER

WaterHealth's UV treatment plants **deliver drinkable water** to thousands who don't have it.

THE BACKGROUND More than a billion people lack access to drinkable water. Theirs is teeming with bacteria and viruses or polluted with raw sewage. The result: Nearly 5,000 children die each day from waterborne illnesses such as diarrhea, cholera, and typhoid. The economic impact is also staggering—$170 billion in losses from water-related diseases.

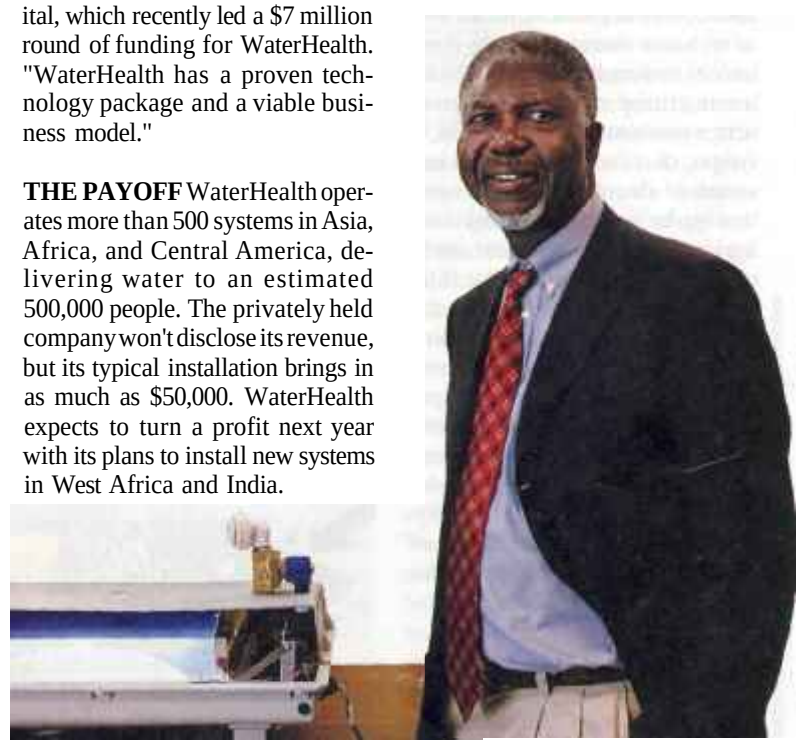
THE SOLUTION WaterHealth International, based in Lake Forest, Calif., sells miniature water-treatment plants to rural communities in the developing world, where potable water is financially or logistically out of reach. When WaterHealth enters a community, it first locates a source—a nearby river or well—and builds a delivery system to get the water to its garage-size WaterHealth Centre. Water is piped through four mechanical filters and a carbon filter, then through a 15-pound ultraviolet disinfection device that removes all but .01% of bacteria and viruses. Ashok Gadgil, WaterHealth's VP for scientific affairs, began developing the system after a cholera outbreak killed 2,200 people in his native India.

The system has no moving parts, and the UV lamp needs just 60 watts of power, which can be supplied by a car battery. Installation costs a 6,000-person village about $10 a person. WaterHealth works with local banks and nonprofits to help finance the systems. It also trains and pays villagers to operate and maintain the water centers, which cost each resident about $2 a year. That revenue is initially split between WaterHealth and the community, which can use the money to purchase the systems outright. "We become part of those villages," says WaterHealth CEO Tralance Addy. "We have as much interest in maintaining the systems as they do."

"The safe-water issue is related closely to costs," says Jim Plonka, vice president of Dow Venture Capital, which recently led a $7 million round of funding for WaterHealth. "WaterHealth has a proven technology package and a viable business model."

THE PAYOFF WaterHealth operates more than 500 systems in Asia, Africa, and Central America, delivering water to an estimated 500,000 people. The privately held company won't disclose its revenue, but its typical installation brings in as much as $50,000. WaterHealth expects to turn a profit next year with its plans to install new systems in West Africa and India.

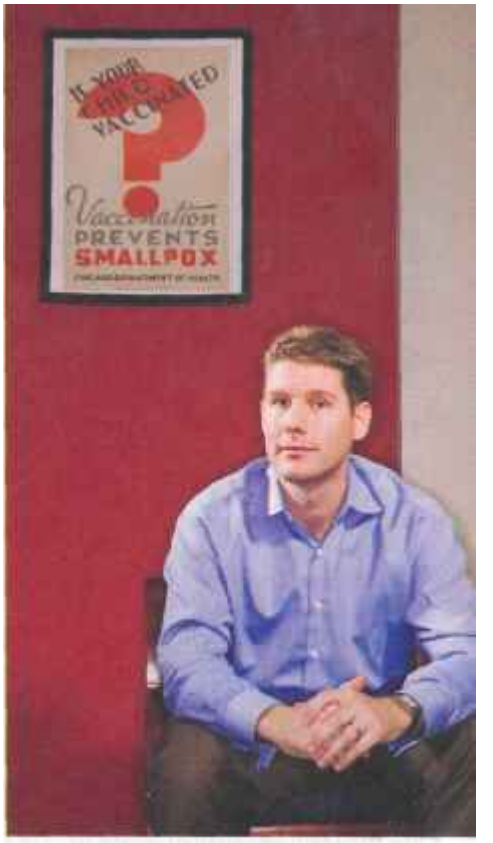
THE OPPORTUNITY WaterHealth estimates that there are about two billion people without access to clean water or whose water supplies could be improved with filtering. "We want to play a leadership role in delivering clean water," Addy says, "but the market opportunity is certainly large enough to accommodate a number of players." *—Michael Myser*



CLEAN MACHINE Addy with his UV device that has been installed in 500 WaterHealth centers, including one (top) in India's Andhra Pradesh state.

PROBLEM N0.6: EPIDEMICS

Voxiva is closing distance and technology gaps to **help stop diseases** in their tracks.



PASS IT ON Meyer thinks better communication can prevent deadly outbreaks.

THE BACKGROUND Avian flu, SARS, HIV/AIDS, and other diseases have the potential to wipe out entire populations. But early detection and quick response are tough in many developing countries, where more than 12 million people die annually from infectious diseases. Often the only way to get word of a deadly epidemic from a remote area to health officials is by mail, which can take months.

THE SOLUTION A techie, a social entrepreneur, and a former government official teamed up to launch Voxiva, a real-time epidemic-tracking system for isolated places with little or no technology. It can be accessed through the Web, cellphones, landlines, and even radio. Health-care workers access the network with passwords and punch in their reports, which instantly go to an online database. Health authorities analyze the reports and respond, confirming diagnoses or sending word that supplies are on the way. India purchased Voxiva to track the spread of disease after the tsunami, Rwanda is using it for HIV, and Indonesia has started a pilot program to help speed up reporting of avian flu.

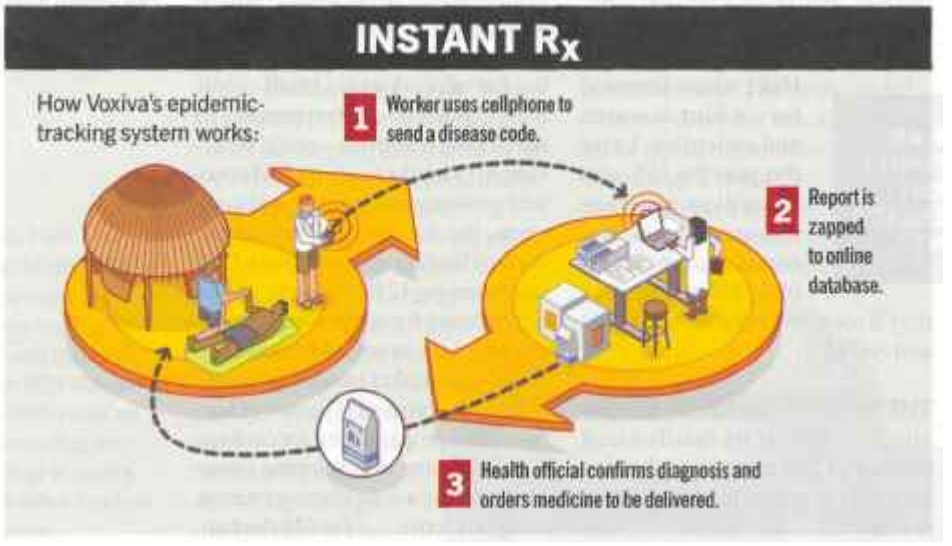
Co-founder and president Paul Meyer learned about wiring the developing world when he created an electronic refugee database in West Africa. Health expert Pamela Johnson, another founder, worked for the United Nations and the U.S. Agency for International Development. Anand Narasimhan, the third founding partner, was chief technologist for a messaging service. Their shared goals: saving the world and providing returns for investors.

> "WE THINK WE COULD BE A $40 MILLION COMPANY IN FOUR YEARS."

THE PAYOFF After five years the Washington-based firm has nearly 100 employees and offices in the U.S., Peru, and India. Not all clients are government agencies. The Institute for OneWorld Health, a nonprofit pharmaceutical company, is using Voxiva to test a new drug for the sand-fly-borne disease leishmaniasis. And private medical clinics operating in far-flung low-tech places use it for collecting patient data.

The cost varies. Voxiva ties its fees to the number of people who will access the system and the time it takes to design and implement a project. The company also charges for tech support and maintenance. Though privately held Voxiva won't disclose revenue, company officials say it's growing by double-digit percentages each year. "We think we could be a $40 million company in four years," Meyer says.

THE OPPORTUNITY Tracking epidemics is just one emerging business. There is rising demand for long-distance learning systems (via phone or PC) that sharpen field workers' skills, and for systems that link big-city specialists with remote areas. "Quick and easy to implement, that's the way to do it," says Meyer. —*Michal Lev-Ram*



PROBLEM N0.7: OVERFISHING

Hawaii startup Kona Blue is pioneering deep-ocean aquaculture that could **help save declining fish populations** around the world.

THE BACKGROUND Overfishing is severely depleting wild ocean-fish stocks and threatening the $158 billion commercial fishing industry. The number of fish caught annually is declining, with a recent study projecting that the world's commercially harvested fish populations could collapse by 2048.

THE SOLUTION Hawaii startup Kona Blue is pioneering deepwater aquaculture to farm ocean fish and take the pressure off wild species. Although many companies grow freshwater tilapia and catfish, few have succeeded in farming flavorful deep-sea fish like yellowtail tuna and swordfish that are in demand at sushi bars and high-end restaurants. That's because ocean fish are harder to hatch. Privately held Kona Blue raises a yellowtail-like fish off the coast of the Big Island of Hawaii—half a mile out to sea and 30 feet down.

Marine biologists Dale Sarver and Neil Anthony Sims founded Kona Blue in 2001, initially focusing their efforts on Hawaiian amberjack, a native species similar to yellowtail that is called kampachi in Japan and is popular as sashimi. The fish, though tasty, was rarely sold commercially because it's vulnerable to parasites and ciguatoxin, a reef-borne toxin that causes neurological dysfunction in humans. Unlike conventional practices of stocking hatcheries with wild fry, the raising of amberjack takes place in a controlled environment from hatch until harvest, limiting their exposure to parasites and diseases. Once the fish reach three-quarters of an inch in length, they are transferred to 50-foot-tall underwater cages to be harvested when they reach five or six pounds. The fish retail for about $20 a pound. The company has branded them as Kona Kampachi and has registered for a trademark. "Kona Blue is as close to a sustainable marine fish farm as possible with today's technology," says Charles Angell, a sustainable-aquaculture consultant in Washington State. "The environmental impact is greatly reduced by locating offshore in deep water with strong currents."

WORLD FISH POPULATIONS COULD COLLAPSE BY 2048.

THE PAYOFF Former Horizon Organic chairman Tom McCloskey and a group of investors have sunk nearly $10 million into Kona Blue during the past two years. McCloskey, now Kona Blue's chairman, says sales will reach $8 million to $10 million in 2007, up from just $2 million last year. Kona Blue has begun distribution at select Whole Foods stores, and Kona Kampachi is already gracing tables at top restaurants such as the French Laundry in California's Napa Valley. Aquaculture is a $70 billion global business, and demand for ocean-farmed fish is expected to rise as a result of no-fishing zones imposed by some states in the U.S., as well as diners' concerns about the environmental impact of freshwater and near-shore fish farms.

THE OPPORTUNITY Kona Blue does not yet have any direct competitors, though a couple of companies are gearing up ocean aquaculture operations. Those interested in starting their own sea farms are halfway there if they've done their due diligence in selecting a salable, noninvasive fish suitable for growing in deepwater pens. After all, there are other fish in the sea and room for plenty more down on the farm. —*Sidra Durst*

GONE FARMING Sims (below) expects his startup to sell up to $10 million of ocean-raised Hawaiian amberjack this year.

Fonte: Fortune, v. 155, n. 4, p. B1-B8, 12 Mar. 2007.