

SUSTAINABLE
CONSTRUCTION
2011/2012

Tragedy as opportunity

It is a truism, albeit sometimes a cold comfort: a disaster always brings opportunities in its wake. Architectural office Elemental interprets this adage in their unique way. Their master plan for the reconstruction of the Chilean port of Constitución after it was destroyed by a tsunami produces not only a new, but also an enhanced urban space.

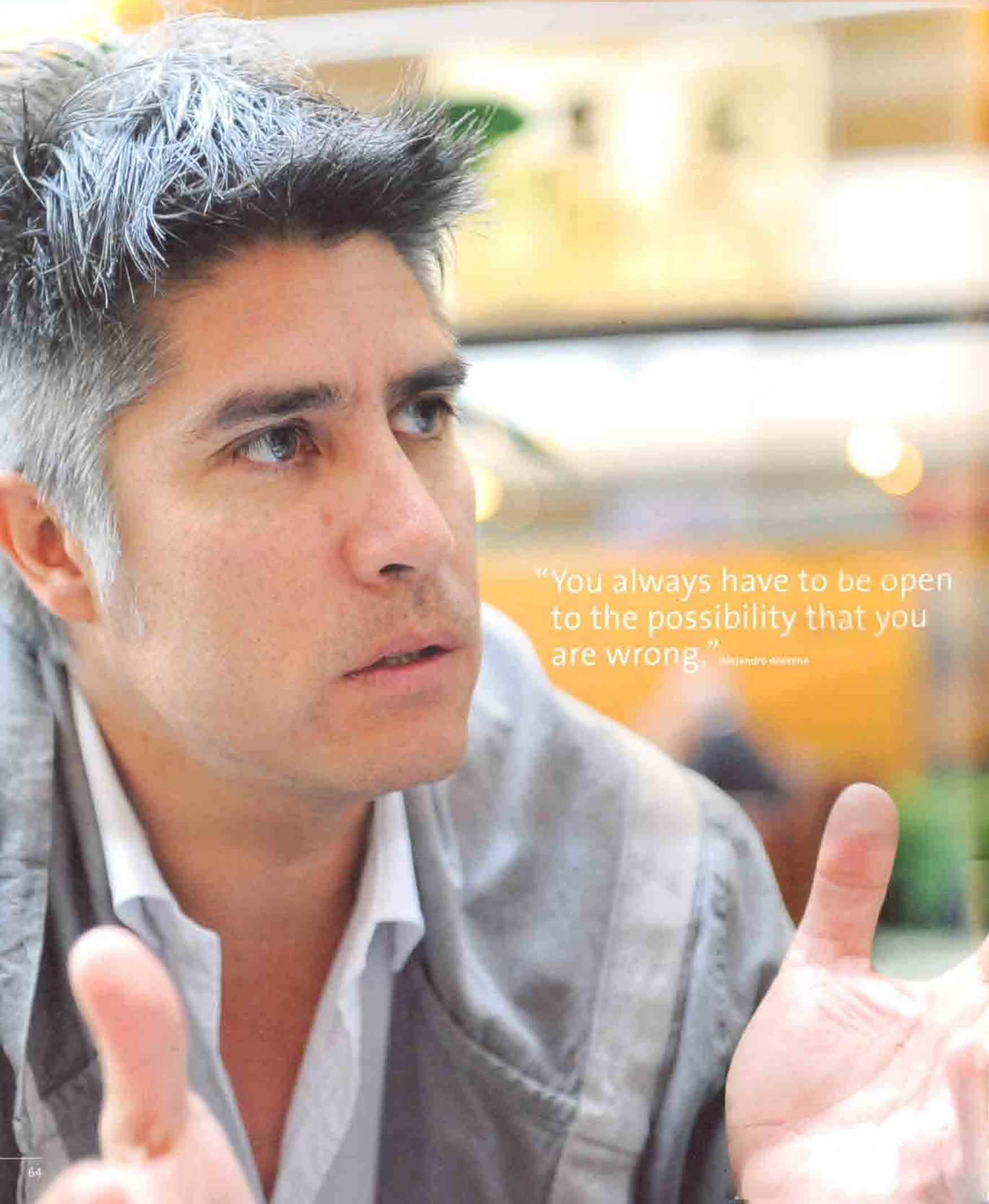


Alejandro Aravena



Behind the forest the new city will be more densely constructed: the former small-scale structures are not going to be rebuilt.





“You always have to be open to the possibility that you are wrong.” Alejandro Aravena

The port of Constitución lies at the mouth of the Río Maule on Chile's Pacific coast. The city's roots go back to 1578. Numbering some 45,000 inhabitants, Constitución owes its relative prosperity to forestry and cellulose production. There are also some important mines in the vicinity. Constitución hit the world headlines after February 27, 2010, the day on which Chile was hit by a magnitude 8.8 earthquake, one of the most powerful ever measured. Its epicenter lay just 60 kilometers south of Constitución. The earthquake was followed by a gigantic tidal wave and countless aftershocks. The total number of fatalities is put at almost 600, and about two million people were directly affected by the catastrophe, which destroyed or badly damaged hundreds of thousands of homes. The total cost ran to about USD 30 billion.

Constitución was hit particularly hard: the tsunami destroyed large sections of the city close to the coast and killed numerous people who could not flee in time. The hospital had to be evacuated, so that first responders reached the devastated areas only after a considerable delay. In those dark days, older inhabitants of the city were reminded of an earlier catastrophe: almost 50 years earlier. On May 22, 1960 an earthquake and the ensuing tsunami also destroyed large parts of the city. To date, the Great Chilean Earthquake or Valdivian Earthquake is the most powerful ever recorded, with a magnitude of 9.5.

90 days to produce a master plan

It was clear that it would take a lot of money, energy, and expertise to rebuild the city after the tsunami of 2010. The state also appealed to private firms for help – and asked a forestry company that operated in Constitución whether it would be willing to support the reconstruction. The company commissioned Elemental in Santiago to draw up a new master plan for the city in 90 days. Elemental is a for-profit enterprise with a social focus. It works on projects in the fields of infrastructure, transportation, public space, and housing. Shareholders include COPEC (Chilean Oil Company) and the Pontifical Catholic University of Chile. Architect Alejandro Aravena has been Elemental's Executive Director since 2006. A former visiting professor at Harvard, he currently holds a professorship at the Pontifical Catholic University.

“Elemental's great strength is projects of public interest,” explains the architect, who was born in 1967. “Our team is able to develop and coordinate complex initiatives. We want to use our housing, infrastructure and public projects to extend the advantages of urban living to all.”

“We use our projects to extend the advantages of urban living to all.” Alejandro Aravena

Don't wallow, act

Elemental calls itself a do tank – in contrast to a think tank. “We love reality,” Aravena says, “and we like to act. You recognize good ideas within two seconds, either you have them or you don't. We don't waste time on detailed diagnoses, but search immediately for solutions. In any case, the problem is usually obvious. We don't necessarily have the expertise for every commission, but we have common sense. And we also know how to talk to people. If you use technical jargon, nobody understands you. The art is to talk simply, without denying the complexity of the problem. You don't have to dwell on details all the time. You just need to be able to say in a few sentences: We are doing this and that in this or that way for this or that reason. That is how a do tank functions!” It was this attitude that qualified Elemental to quickly develop a master plan for Constitución. “Beforehand we had never worked on commissions of this kind. But the fact that we were outsiders also had its advantages: It meant we could ask dumb questions and look at things without prejudice. So we agreed among ourselves: We just have to summon all our knowledge and years of experience and let ourselves be guided by our professional intuition.”

Schools have absolute priority

Alejandro Aravena is convinced that the deadline for developing a master plan was so short because a private company commissioned it. “If government offices had been involved at the beginning that would have taken a lot more time.” And time is precisely what was not available: In South America we were heading into winter. “There was nothing, the infrastructure was completely destroyed,” the architect explains. The do tank immediately sought contact with the population whose world had just collapsed and now had to be rebuilt. Aravena: “If people are worrying about where they will spend the night, they have little interest in thinking about the medium- or long-term future of their city. At such times it is crucial how you present people with options. This is not the time for abstract debates. So we sat down with the people and told them: ‘We have to recreate the entire city. But you know far better than us what you need. Where should we begin?’ It was soon clear that the school had the highest priority – not because parents thought that teaching would be really good for their children at this time, but because the school provided meals for the

children. “And because it would be a sign of normality when the children could return to school,” Alejandro Aravena adds. Other priorities included the hospital, shops, and the bus and railway station, “because when people come back to shop in the city, the residents can earn an income again and take charge of their own lives.” It may surprise outsiders that accommodation was not the main priority for the people concerned, but as Aravena knows: “After a disaster you have far more important things in your life to worry about than the fact that you have to rely on other people for temporary accommodation.”

Threefold strategy

Within a few weeks Elemental had developed a plan to ensure the long-term survival of Constitución. Aravena explains: “Chile already had a lot of good earthquake measures. Most structures are built to code, which is why the number of victims even in strong earthquakes is comparatively small. However, little has been done to prepare coastal cities for tsunamis.” The objective of the members of Elemental was a strategy to mitigate the effects of a tsunami. The plan that won them a prize in the Holcim Awards competition is threefold: an evacuation scheme, a forest to mitigate the impact of the tsunami, and better organization of districts close to the coast. The combination of these three strategies allowed the city to be reconstructed as closely as possible to where it had always stood next to the sea and the river. “Large construction companies offered to throw up a few thousand apartments beyond the city limits. But that would not be sustainable. The people work in the city, and we wanted families to stay where they had their networks.”

15 minutes to safety

The evacuation plan measure is crucial to restoring people's confidence in their familiar environment. “Fifteen minutes after a tsunami warning, every inhabitant has to have reached a safe place,” says Alejandro Aravena, “a place where the tsunami will not have a fatal impact because it will arrive with less energy and bearing less debris. Water alone will not kill you – what is life-threatening is all the material that the tsunami carries along with it.” The object was to guide the flight of the endangered population along routes that would allow them to escape quickly – and to remove all possible obstacles from their path. The new quarter bor-



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dered by the Pacific and the river will therefore have three wide streets – Rosas, Cruz, and Pinto – that run at right angles from the river to safe zones in the city. These areas lie at least ten meters above sea level and out of reach by a tsunami. The entire quarter is divided into blocks so that the residents can reach the flight routes quickly and without obstruction. All the flight routes will be illuminated by solar lighting and well signposted. There are also plans to install an alarm system so that everybody can hear the evacuation announcement.

Trees to break the impact

The second measure of Elemental’s threefold plan is a forest along the coast and river bank. Until recently most of the area was private property. The idea of letting a forest absorb part of the impact of the tsunami came to Aravena as he was leaving the office one evening. As he says, “You can fight a tsunami as little as you can fight an earthquake. But what you can do is reduce the wave’s energy. Trees are good for that because they are pli-



The plan includes the local production of wooden manufactured materials. The aesthetic approach goes directly on the hand of local productive development. So there are no arbitrary decisions of design. The community itself is endorsing the reconstruction of its buildings, such as Enrique Donn school (top left), Harbor Master (left), Fire station (below left), Train and Bus station (below right).

enough to provide enough security for Constitución in the medium term? Alejandro Aravena responds: “Of course you can put up a wall faster than plant a forest – but a wall will never protect you! Artificial constructions cannot withstand the force of a tsunami.”

A protective barrier as park

Fortunately, trees grow very fast in the region around Constitución – which is why it is a center of the cellulose industry. In 20 years you have a forest. Elemental worked closely with the university to choose the appropriate trees; in the meantime they have decided in favor of a species of indigenous pine. “In response to a geographic threat we propose a geographic answer,” Aravena comments. Apart from protection against the full force of the tsunami, the forest zone along the river has other advantages for Constitución, for example a park in the most beautiful location. “A tragedy is always an opportunity too,” Alejandro Aravena reminds. “The park has opened up the city to the river, providing public access to what the community sees as their real identity.” The forest improves the quality of urban living to the advantage of all. It also triples the amount of green space in the city from the previous meager 2.2 m² per resident to 6.6 m². In addition, the forest serves as a retention basin in times of flooding, which previously was an annual occurrence in areas along the river.

Compromise is unavoidable

Because no housing is going to be rebuilt along the bank of the river, the remaining residential space must be better utilized through denser building. The third component of the threefold strategy relates to the rebuilding in the quarter. The residential buildings will be a little higher and they will stand on pier-like



structures; a tsunami will cause much less damage if it can rush through under buildings on stilts, so to speak. The new design plan for the quarter contains innumerable details that now have to be put into effect individually, in many cases after further improvement. “You always have to be open to the possibility that you are wrong,” Aravena remarks. “We constantly question what we are doing; it prevents us from taking a blinkered approach to our work. For instance, a major problem frequently cited in Constitución was “You are always talking about improving the quality of our living space, yet we have a cellulose plant in the middle of the city that causes massive pollution.” It would appear logical to move the factory out of the city. The plant was built half a century ago as a state enterprise. At the

time it was felt that a factory should be as close to the port as possible. Nowadays the plant would be built close to the forest. However, if the plant really did move out of the city it would be rebuilt close to forests at a great distance from Constitución. Aravena is convinced that “Deprived of its *raison d’être*, the city would also disappear. Consequently, the factory must stay in the city – but we have to do something about the emissions immediately.”

“Would I want to live here?”

All the plans and concepts that Elemental developed had to be approved by the government bureaucracy. It took months to discuss the budgets and draw up calculations for all the details of all the plans. “The money is fi-

nally there,” Alejandro Aravena says, “but the experts are still on site doing sums. We are talking a lot of money: to set up the park we have to buy private property.” Of course the state could simply expropriate the land to implement the plan, but such a procedure would not be opportune in the present situation. Aravena knows that “The people have to back the project. We depended on strong public and political support for our project. We have received it, and now the project can go ahead.” The architect thinks that the Holcim Award for Elemental’s strategy will facilitate project implementation. “Any confirmation that our project is a good thing helps us at the political level. Word then gets about. Hey, these guys are right!” But ultimately, the most important factor for architects is not necessarily the perception of outsiders, but the architect’s own appraisal. “The ultimate test for our proposals is always the question: ‘Would I want to live here if our plans are put into effect?’ In the case of Constitución I can answer this question without reservation in the affirmative. You are not often asked to develop an entire city, which is why I am happy that we have found such good solutions for Constitución.”



In the regional phase of the 3rd Holcim Awards competitions, this project was awarded Silver in Latin America. See page 150.



Sustainable post-tsunami reconstruction master plan

Constitución, Chile

This project automatically qualified as a Finalist in the Global competition 2012. See page 62.

This master plan was developed after the 2010 earthquake and tsunami that struck Constitución, a city of 46,000 people located on the shore of the Pacific Ocean and 300 km southwest of Chile's capital, *Santiago*. *8.8 Earthquake Chile – Sustainable reconstruction* master plan proposes a strategy to respond with "geographical answers" to the "geographical threats" of the earthquake and tsunami risk. Instead of considering a construction ban or a massive barrier along the risk zones, the project proposes to plant the flood-prone areas in order to break the waves. Located behind this first line of defense are facilities that have specific restrictions on the use and layout of ground floor areas. These two interventions are accompanied by an evacuation plan as the third protection element. The aim is a long-term preservation of the city at its historical position next to the estuary mouth – a strategic location for the city's economy. The complimentary concept is to create public open spaces along the banks of the river that alleviate the lack of inner-city recreation areas as well as support the dissipation of rainwater runoff in order to avoid further flooding.



Project authors (from left): Alejandro Aravena, Juan Cerda and Diego Torres, Elemental, Chile. Not pictured: Gonzalo Arteaga, Fernando Garcia-Huidobro and Cristián Martínez, Elemental, Chile, Alejandro Gutiérrez, Arup, United Kingdom; Eugenio Tironi, Tironi Asocciados, Chile.

Comment of the Holcim Awards jury Latin America

The jury values the thoughtful approach of proposing a long-term strategy of upgrading the built environment rather than implementing an ad hoc action plan to reconstruct that which had been destroyed by the tsunami and earthquake. Furthermore, the project's effect: the establishment of a social community through citizen participation was recognized, demonstrating the contextual and social sensitivity of the master plan.

