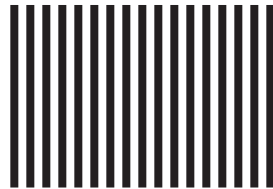


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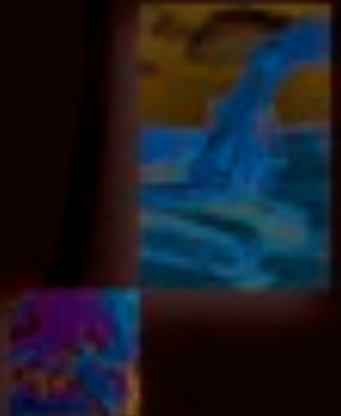
“Which Way?”

A series of occasional papers published by
The Frederick S. Pardee Center for the Study
of the Longer-Range Future at Boston University

Can Technology Help Solve the Arab-Israeli Conflict in Palestine?

by Dr. Frank P. Davidson
Introduction by David Fromkin





Which Way? pamphlets highlight emerging controversies at the crossroads: the crossroads where decisions must be made about choices that will affect the future of humankind through the twenty-first century and into the next. They are intended to illuminate, inform, arouse interest, and inspire debate among opinion-molders, decision-makers, and an informed and thoughtful public.

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“Which Way?”

S E R I E S

Controversies About the Future

Can Technology Help Solve the Arab-Israeli Conflict in Palestine?

by

Dr. Frank P. Davidson

Introduction by

David Fromkin

A PARDEE CENTER PUBLICATION



A native of Massachusetts, Frederick S. Pardee received both a bachelor's and a master's degree from the Boston University School of Management. He worked for 13 years at the RAND Corporation as a systems analyst, studying long-term economic forecasts. He then spent several

years working as an independent consultant, primarily for the U.S. government. In 1974, he turned his professional attention to managing his real estate investments, while actively maintaining his interest in studying the future.

In 2000, at the turn of the millennium, Mr. Pardee established the Frederick S. Pardee Center for the Study of the Longer-Range Future at Boston University with an endowed professorship and annual visiting professorship to consider the challenges that lie ahead for mankind in the decades to come.

For more information about the Pardee Center at Boston University, visit our website at www.bu.edu/pardee, or contact us at pardee@bu.edu or 617-358-4000.

INTRODUCTION

by *David Fromkin*

Dr. Frank P. Davidson is the father of the English Channel Tunnel. It was he, with a colleague, Cyril C. Means, Jr., who revived that long-dreamed-of project in the mid 1950s—forming the Channel Tunnel Study Group, the consortium that went ahead to initiate it, and drafting its Protocol of Agreement (1957). In the decades that followed, whenever the project was derailed, Dr. Davidson put it back on track.

Throughout his life Dr. Davidson has displayed a gift for imagining large-scale projects that could provide a social, political, or ecological benefit. So it is with the proposal that follows, in which he aims at facilitating an eventual solution to the Arab-Israeli conflict in Palestine by addressing one of its components: the land question.

I must admit that it was with a certain hesitation that I agreed to read his plan. For one thing, I am skeptical of attempts to solve human and political problems by using high technology. To this Dr. Davidson responds that he proposes to use *low* technology, not high; and that if such an approach proves effective in this one instance, it might well be adopted in others as well.

But—and this was my major objection—it did not address the heart of the conflict. A shortage of land—and even water—in Palestine, though often alleged to exist by Arab spokesmen beginning in the 1920s, has always been a non-issue. There always has been enough to go round. There always has been room in Palestine for both Arabs and Jews. Nor was that the real grounds for Arab objections to the creation of a Jewish National Home in Palestine. The real objection was to seeing the neighborhood taken over by non-Moslem foreigners and transformed. It was about love and hate and religion and blood feuds—not about real estate.

To this Dr. Davidson responds that with continuing population growth in Palestine, and with the possible emergence of new political or security frontiers, a shortage of land might well develop even if none existed before. Moreover, the availability of new land might well facilitate an agreement between the two embattled peoples. A related prospect is the near-term incorporation of a free-trade zone in the Gaza Strip in order to provide substantial employment opportunities.

The proposal that follows, therefore, is not put forward in the belief that of itself it will *solve* the Arab-Israeli conflict. Rather, it is proposed in the belief that if one day in the future a peace settlement seems possible—and in these days of rage and hatred that possibility looks to be remote indeed—Dr. Davidson's suggestion might remove one of the obstacles to its realization.

RECLAIMING LAND FROM THE SEA

A "Dutch Solution" as an Overlooked but Promising Element for Improving the Prospects of Peace in the Middle East

by *Dr. Frank P. Davidson*

Among the conspicuous causes of animosity in the dispute between Arabs and Israelis in Palestine are the persistence of dreadful refugee camps for—already—several generations of Palestinians, and the unceasing establishment of new Israeli settlements in the midst of hostile communities.¹

Fortunately, there is a viable solution that deals with both. It requires 1) the unremitting reclamation and improvement of fertile and buildable land for the Palestinians, for instance by extension of the Gaza Strip, and 2) the forthright expansion of Israel into the eastern Mediterranean Sea.

That there are no technical barriers to such a program has been confirmed by competent preliminary studies over a period of years.² As a signal of an oceanographic "all clear," the government of Israel announced, in September of 2002, the prospective building of an offshore island for recreational purposes.³ Whether the new initiative suggested herein is to take the form of offshore islands or of the seaward extension of existing territories (or both) must be debated and decided by the parties most directly affected. While regional insecurity remains endemic, governmental or international guarantees may well be needed to attract and reassure investors; yet there is a long history of the successful and profitable development of coastal real estate. Anyone who has lived in or even visited Holland can bear witness to the peace and prosperity of an exemplary nation more than sixty percent of which subsists on land won from the sea.⁴

The unadorned starkness of the option outlined above has one acknowledged defect: it lacks intellectual complexity; it is unabashedly obvious. Having attended numerous meetings in the early days of the revival of another "obvious" engineering scheme—the railway tunnel now operating between England and France—I am beginning to form the conclusion that the world could find appropriate uses for an "institute for the obvious": how else are we to mobilize support for overdue projects that can promptly address major human needs?

In the case under review, a compatible preparatory step has been studied by MIT's Professor Emeritus Ernst G. Frankel: the incorporation of a Free Trade Zone on the Egyptian border of the Gaza Strip, to provide substantial employment to Palestinians in industries attracted both by the availability of well-educated labor and by the legal access to the European Common Market. The first stage of an "artificial island" linked by a causeway to the mainland could accommodate a port for goods manufactured or assembled in the Free Trade Zone.

It has been fashionable to blame political and even clerical leadership for the dire dilemmas which beset the contemporary world scene. Responsibility for such distress deserves, however, to be shared more widely: the academic world has too often treated desperate social problems with a rather distant if benign eye. The truth is that the valuable specialized knowledge squirreled away in universities and research centers must be brought within reach of the levers of power capable of exercising palpable influence on the course of events. This is precisely why the renowned Dr. Harold D. Lasswell of the University of Chicago and the Yale Law School recommended, late in his life, and to a small circle of admirers and disciples, the adoption of "decision seminars"⁵ which would bring together, at the same time and place, both the experts with necessary information on a problem and the individuals in positions of authority or whose views would weigh heavily with decision-makers. It is partly because the Channel Tunnel Study Group was thus configured (in 1957) that, despite a long interval that ensued, its opinion ultimately prevailed and found full expression in the steel and concrete of the project brought to completion in the years 1986–1993. Among the steadfast supporters of the revival of this "shaggy dog" of macro-engineering dreams were Thomas S. Lamont of the Morgan Guaranty Trust Company of New York, General Georges F. Doriot (founder and chairman of American Research and Development Corporation and a popular professor at the Harvard Business School), and David Fromkin, Esq., a family friend who later was to write *A Peace to End All Peace*, the classic history of the modern Middle East.

With respect to the concept of "new land for old disputes," there is the very real risk that a full-blown series of official conferences would suffer from premature publicity and hence engender exaggerated hopes followed by widely echoing disappointments and recriminations. In the situation under consideration by the present inquiry, perhaps a relatively inconspicuous—but *not* secret—sponsor could invite the key participants and make sure that the relevant issues are squarely addressed? And the key participants should surely include potential investors of the right caliber: herein lies an opportunity for non-governmental enterprises or mixed-economy entities to help untie the Gordian knot.

Clearly, a procedure to accomplish the simple objectives mentioned herein will have to cover legal, diplomatic, geological, environmental, technical, economic, and—not least—political topics. There must be a transparently fair and utterly reliable arrangement assuring all inhabitants of Israel and Palestine complete, impenetrable personal and family security. Such “an outcome devoutly to be wished” will be fostered by wider acceptance of the thesis propounded by the philosopher William James in “The Moral Equivalent of War.”⁶ In fact, James’s concept of “an army against nature” was long ago embodied in the “dike army” which was subject to instant mobilization whenever rampant floods threatened the defenses of the Netherlands against the North Sea. At some point, will it not be wise to consult the *Rijkswaaterstaat*, the ministry traditionally charged with the maritime safety of the Dutch Republic? This will be a prudent step to verify optimal design and durability of *polders* destined for the eastern Mediterranean.

For the effort envisaged in these pages, there is an ample background of support and an untapped reservoir of goodwill. Just a quarter-century ago, a historic if insufficiently heeded conference, “Islam-West,” was held in Venice, under the auspices of the Cini Foundation. Twelve leading delegates from Islamic countries and twelve varied spokesmen from the West made a mutually respectful and wholly amicable attempt to list measures to improve knowledge and understanding between two cultures that had been largely out of touch for too long. The conference was chaired by Lord Caradon, who had been British Ambassador to the United Nations. A noted Afghan scholar, Nadjin oud-Dine Bammate, represented UNESCO—and was instantly applauded both for intellectual and athletic prowess! Three representatives were named by the Holy See. There was a free and lively exchange of views; the total absence of klieg lights facilitated both creativity and candor. One should do everything possible to reignite the interest of The Rensselaerville Institute on Man and Science, now known as The Rensselaerville Institute, in the questions adumbrated, on its fine recommendation, in 1978.⁷

Additional moral and intellectual sustenance can be expected from personalities associated with the Macro-Engineering Commission recently named by Dr. John W. Landis, President of the International Association of Macro-Engineering Societies. Dr. Landis, a member of the United States National Academy of Engineering, is a nuclear scientist with broad experience in industrial management; he has now urged his colleagues to prioritize a carefully honed list of major engineering ventures. It is realized that, along with our epoch’s much-touted technological prowess, there is the risk of fascination with exploits that, in human terms, risk falling into the category of “trivial pursuits.” For sums that would be risible for the exploration of outer space, a pragmatic program could be well and solidly launched to end the quite unnecessary human tragedy in the Middle East.

All parties to the dispute would welcome a broader acceptance and definition of the "Road Map" put forward by President Bush. Hopefully, the low-tech engineering steps suggested in these pages will furnish practical guidelines for "moving from A to B." Of course the specific malaise in the Middle East would be greatly alleviated if the United States and Europe, together with leading powers in Asia and elsewhere, were able to devise, refine, and advocate a common program tailored to the historic opportunity now presented to North Africa. Here too, overlooked low-tech can lead the way. Little more than a century ago, Canadian-born engineer George Chaffey saw vast potential wealth in the sands of what had been known as "Death Valley." He not only changed its name to "The Imperial Valley"—he also assured long-term irrigation by diverting the still-abundant waters of the Colorado River, and he set up a system of mutual undertakings which assured settlers of a reliable flow of water, while fully respecting public-service constraints. To this day, central California remains the most productive and prosperous agricultural area in the United States. And in their later years, it is noteworthy that the Chaffey brothers participated in the decisive development of the Murray River Valley in Victoria, Australia.

An early—and notable—enthusiast for the interdisciplinary development of North Africa was Louis Armand, modernizer of the French National Railways (SNCF) and one of the first heads of EURATOM. Monsieur Armand's biographer, Henri Teissier Du Cros, now heads the *Institut Louis Armand* in Paris and, as a judge retired from the *Conseil d'Etat*, could offer sophisticated guidance in the organization of mixed-economy structures apt for regions "about to take off," such as the Middle East and North Africa.

I owe to Dr. Peter E. Glaser, inventor of the Solar Power Satellite, the information that the late Najeeb Halaby, as President of Pan American World Airways, once inaugurated a research program into the feasibility of building up ranches in a region of North Africa roughly the size of Spain! Of course such dreams would, in order to become operative businesses, require the benevolent patronage of both Europe and the United States and, for enduring efficacy, of a re-galvanized world community: the food produced by an efficient North Africa would have to be admitted, without prohibitory tariffs, into the world's markets. Alas, during the recent World Trade Organization haggling, we again witnessed unabated resistance by farm interests to any weakening of tariff protection against the import of fruit, vegetables, and meat. Is there, perhaps, a ray of sunlight?

Lester Brown⁸ has observed that mainland China may soon move into the position of a major and perennial net importer of grain, partly due to accelerated desertification but also as a result of remorselessly increasing population. There has, of course, been talk in Europe of the social and economic costs of serving as a preferred destination for destitute North Africans and their families. Would there not be counterbalancing benefits to Europe too if North Africa itself could once more become a center of prosperity and progress? "A rising tide lifts all boats."

In what Jay W. Forrester has presciently dubbed "this closely coupled world," an adequate water supply for irrigated crops in North Africa will likely require supplemental supplies from beyond the region. One possible answer, proposed in 1975 by Professor Joseph Debanné of Ottawa and more recently confirmed by Professor Emeritus Ernst G. Frankel,⁹ is to duct part of the Rhône River as it debouches into the Mediterranean, through a plastic conduit across the Sea, to be pumped over the Atlas Mountains into the northern Sahara. At a later stage, such a project could earn the attention of reporters with a special interest in mountain environments, such as Sara Jane Neustadt (Mrs. Peter Molnar) who has ably recounted¹⁰ the human impacts of engineering innovations built near communities long established in the hills and mountains.

8 Ever since World War II, France and the United States have shared, perhaps subliminally, an unacknowledged common policy: the exclusion, through high tariffs, of North African farm and ranch products from ready access to markets. It should now be clear that this "policy"—if such a dignified word can be applied to what has been an automatic or "knee-jerk" attitude—comes with very high costs indeed. Even the United States has been caught in the dynamics of a policy failure that has helped ignite not only the Middle East but also has provoked hostility in other regions. This discouraging cycle of violence and underdevelopment has deprived several generations of the opportunities which the West advertises on daily TV! In such a viewpoint, the necessary and potentially very rewarding negotiation between the USA and France has not yet been defined, let alone initiated. Realistically, both France and the United States have everything to gain by contriving a dynamic partnership with "the Maghreb" so that North Africa can, at last, regain its historic social and economic health. Was not the Arabic alphabet partly launched at the University of Fez? Was not Ibn Khaldūn one of the world's very great historians?¹¹

In addition to an agreed and articulated joint policy for the region, official leaders should organize a suitable framework so that unemployed and untrained young people can join together under professional supervision to participate promptly in the visible improvement of the public environment. When President Franklin D. Roosevelt determined upon the setting up of a Civilian Conservation Corps, within one week of the Executive Order, recruits were enrolled and set to work. The constantly growing and therefore increasingly overcrowded world population is ever more susceptible to natural and man-made disasters. Like it or not, this is a statistical fact. Is it not sensible to launch, without further delay, an International Conservation and Rescue Service¹² that can function internationally on the model of Camp William James,¹³ the “new model” camp of the Civilian Conservation Corps? A professionally led service will take full advantage of recent developments such as telemedicine so that young people everywhere can benefit from the prompt application of the best medical methods and advice. Pioneers such as Dr. Jean-Paul Thierry and Mr. John Evans deserve continuing accolades for their encouragement of innovations that apply telecommunications to the most basic human needs, that is, on behalf of life itself.

Dr. Svetlana Broz, the eminent cardiologist, has pointed out¹⁴ that many members of competing and combating ethnic groups (she is, after all, a granddaughter of Marshal Tito) have repeatedly crossed ethnic, cultural, and religious lines to rescue individuals and families who were theoretically “on the other side.” Does the world now await a great Statue of Fraternity to rival New York’s Statue of Liberty?

9

In designing Free Port Zones and new jurisdictions on land reclaimed from the sea, legal and financial statesmanship will be needed, perhaps on the level of Jean-Paul Calon’s stunning contribution to the settlement between Egypt and the Suez Financial Company—and with the full participation of the World Bank—promptly after Nasser’s nationalization of the Suez Canal. Experts familiar with the region, such as the economist Lester Thurow, should be consulted on the choice of measures that can produce immediate and visible benefits to young people caught in the current vortex of deprivation of both education and employment. True, recent editions of *Foreign Affairs*¹⁵ have published plausible general propositions. But state-to-state diplomacy must now be supplemented and reinforced by compatible initiatives from the private sector, so that mixed-economy institutions can play a defined and positive role in the new territories whose construction now only awaits green light from a reawakened international community. To preside over the impending process, would it be possible to recruit such a proven personality as Dame Margaret Joan Anstee, the former Deputy Secretary-General of the United Nations who for eighteen difficult and dangerous months headed the UN Peacekeeping Mission in Angola?¹⁶

Nor should one underestimate or ignore the importance of dedicated efforts for peace in other parts of the world. The Global Infrastructure Fund founded by the late Masaki Nakajima, and the Peace Engineering Council established by Professor Manabu Nakagawa will have their word to say. The Asian Institute of Technology, now headed by Monsieur Jean-Louis Armand, can, in due course, offer both expertise and counsel. In our own Commonwealth of Massachusetts, Purrington House can provide a deft human touch at just the right time! Eugene Taylor, Ph.D., a frequent lecturer at the Harvard Medical School on the intellectual legacy of William James, can offer trans-cultural insights of enormous value. And individuals who have traveled broadly and bravely, such as Oxford-trained Janet Caristo-Verrill and former Boston Museum of Science specialist Ruthanne R. Cowan, will find appropriate niches for adventurous volunteering, as the context ripens. We can already take comfort from the successful initiatives of Paula Nirschel in opening the doors of more than a dozen U.S. universities to qualified young women from Afghanistan. The human resources waiting to be tapped are considerable—and I cannot refrain from mentioning Dr. Jane Alexander, perhaps the first woman to be Under-Secretary of Agriculture of an American state (Pennsylvania), and who has experience in agricultural conservation activities in Ethiopia, India, and many other countries.

10

All of us concerned with “a seaward thrust” should review the impressive literature and history devoted to land-reclamation-from-the-sea. *The International Legal Regime of Artificial Islands*¹⁷ remains a basic text. The Monaco Conference on Artificial Islands, organized by Monsieur Lucien Deschamps more than a decade ago, has files well worth consulting.¹⁸ One wonders why this wealth of knowledge and experience (a great number of artificial islands now surround the archipelago of Japan!) has been so long neglected.¹⁹ Perhaps we may now better understand why G. K. Chesterton, in *The Ballad of the White Horse*, cautioned: “There is always a thing forgotten/There is always a thing down-trod” and then, for re-emphasis, restated the point later on the same page: “There is always a forgotten thing.”²⁰ It would be a supreme irony if the out-of-control internecine warfare in the Middle East were, even in part, a consequence of the absent-mindedness of scholars who forgot to examine well-known evidence because its relevance to the problem-at-hand was misconstrued!

George von Lengerke Meyer, Theodore Roosevelt’s friend and Ambassador to Turkey, summed up such situations rather aptly: “Things alter for the worse spontaneously unless altered for the better designedly.” If the reader protests that our disquisition has not even mentioned the word “Jerusalem,” let me remark in closing that this difficult subject can be better addressed when families and communities have secure and adequate sites. True, this implies walking “one step at a time.” Is there any other way to walk?

ENDNOTES

1. See the lead editorial, "New Tries for Mideast Peace," *The New York Times*, October 31, 2003.
2. The "state of the art" can be gleaned from "The Call of the Islands," *Technology Review*, Vol. 94/No. 8, pp. 34–40, November/December 1991, article by Ernst G. Frankel, Professor Emeritus of Ocean Engineering, MIT.
3. *Jerusalem Post* Internet Edition, November 11, 2002.
4. See Frank P. Davidson, *MACRO—Big Is Beautiful*, London: Anthony Blond, 1986, pp. 426–30. The volume is dedicated "To the Dutch, who engineered a nation out of the turbulent North Sea, and to the Romans, whose legions taught them how to build dikes and, on another continent, demonstrated that the Sahara Desert is not invincible."
5. *Ibid.*, p. 107.
6. First published in *International Reconciliation*, 1910. The essay was reprinted in *American Youth: An Enforced Reconnaissance*, Harvard University Press, 1940, appendix.
7. In 1978 The Rensselaerville Institute on Man and Science issued a brochure, "Islam and the West Programme," published in Rensselaerville, New York 12147.
8. Lester R. Brown is President, Earth Policy Institute, 1350 Connecticut Avenue, NW, Suite 403, Washington, D.C. 20036.
9. Joseph G. Debanné's original proposal appeared in *Technology Review*, Vol. 78/No. 1, October/November 1975, pp. 1–8. Professor Frankel's updated review appeared in *Interdisciplinary Science Reviews*, London, England, 1998, Vol. 23/No. 4, pp. 317–21.
10. Sara Jane Neustadt, *Moving Mountains—Coping with Change in Mountain Communities*, Boston, Appalachian Mountain Club, 1987.
11. For an impression of the importance of this personality, see Ibn Khaldun, *Peuples et Nations du Monde* (2 volumes), Paris: Sinbad, 1986, and Paris: Actes Sud, 1995.
12. Frank P. Davidson, "A Conservation and Rescue Service," *Technology in Society*, Vol. 18/No. 4, 1996, pp. 419–42.
13. Professor Jack Preiss wrote a comprehensive history, *Camp William James*, Norwich, Vermont: Argo Books, 1978.
14. Dr. Svetlana Broz, *Good People in Evil Times*, New York: Other Press, 2003.
15. Consult *Foreign Affairs*, July/August 2003—especially Martin Indyk, "Trusteeship for Palestine?", May/June 2003, pp. 51–67.
16. Dame Margaret Joan Anstee, *Orphan of the Cold War—The Inside Story of the Collapse of the Angola Peace Process, 1992–93*, London: Macmillan Press Ltd., 1996. See also by the same author the (remarkable) autobiographical *Never Learn to Type—A Woman at the United Nations*, Chichester, West Sussex: John Wiley & Sons, 2003.
17. Nikos Papadakis, *The International Legal Regime of Artificial Islands*, Leyden, The Netherlands: Sijthoff, 1977.
18. Consult Monsieur Lucien Deschamps, *Secrétaire-Général*, Prospective 2100, 1 Place Aristide Briand, 92195 Meudon Cédex, France.
19. Of general interest: *Man-made Islands*, Technical Paper Number 4 by John Allen, written for the Major Projects Association, c/o Templeton College, Kennington, Oxford, May 1987, can be consulted with permission.
20. G. K. Chesterton, *The Ballad of the White Horse*, London: Methuen & Co. Ltd., (Ninth Edition, 1927) p. 52.

POTENTIAL FOR RECLAIMING LAND FROM THE SEA OFFSHORE ISRAEL AND JORDAN

Feasibility Memorandum by Dr. Ernst G. Frankel, Professor Emeritus of Ocean Engineering, Massachusetts Institute of Technology, December 2003

General

There is an opportunity for the provision of additional land for Israel and the Palestinians by reclaiming land from the sea by either coastal reclamation or the construction of offshore islands. These methods have been successfully used in Singapore, which added nearly 8 percent to its land mass since independence, and by Japan, which constructed over 22 major artificial islands with a combined area of over 8 square km to reduce urban congestion and remove port, airport, and industrial activities from the inner cities.

Coastal and offshore reclamation has become an effective and economical means for the creation of new waterfront land, and the Japanese are now planning even larger-scale offshore reclamation projects between Japan and China as well as along much of the Japanese coast.

In all there are currently more than 30 additional coastal and offshore reclamation projects under development which are expected to add over 22 square km of new coastal and offshore land. In addition, countries like Holland have added hundreds of square km of land by dike enclosures or by enhancing accretion. There are similar examples, such as in South Carolina (USA), Brazil, and numerous other locations, where material ocean erosion was not only stopped but actually reversed, adding large areas of new coastal land.

12

Bathymetrics and Sedimentology

Israel has a rather shallow coastline and fairly parallel depth lines, which have a gradient of about one in fifty to one hundred. In other words the -20 m depth line is about one to two km offshore. In some places there are plateaus at -5 m, -12 m, and -20 m depths, with a fairly parallel level plateau between -20 m and -25 m. For example, the coal port of Hadera, halfway between Haifa and Tel Aviv, consists of an offshore pier of about 200 m in length parallel to shore about 1,600 m offshore in about 18 m of water and connected by a piled causeway to the shore.

The -25 m contour is in some places as far as 5 km offshore, although it is generally less than 3 km offshore. Water depths increase more rapidly in the north, where they reach -50 m well within the 10 km contour, while along the Gaza Strip and all the way to Tel Aviv sediment build-up from the littoral currents transporting solids from the Nile delta cause the -10 m contour to move to 4–6 km offshore and the -20 m contour is 5–12 km offshore.

Text falls on inside back cover

Littoral currents move usually northwards at speeds of 0.4–0.6 m/sec along the coast and continue to deposit significant amounts of sediment, largely originating at the Nile delta, although total deposits have been greatly reduced since completion of the Aswan Dam, which has significantly diminished the sediment content of the Nile delta.

As a result, any coastal protrusion, barrier, or offshore artificial island would cause significant accretion and sediment build-up that would generate large areas of new land over time. Accretion rates per meter of impermeable barrier are estimated at about 600–1,600 cm³/year. Therefore, a barrier in 10 m of water would generate a new square meter every 10 years or an accretion rate of 0.1 m/year.

Reclamation

Reclamation of coastal land would usually be done by a dike and fill operation. The costs of dikes with protective armor vary with water depth and are estimated as follows:

Water Depth	Costs in \$/meter
-5 m	\$ 8,000
-10 m	\$ 30,000
-15 m	\$ 50,000
-20 m	\$ 100,000

Costs of fill, assuming fill is hydraulically dredged from the ocean bottom adjacent to the site, is about \$3.00/cubic meter.

Assuming diking of a coastal area 5 km offshore in -5 m of ocean depth, total costs per square km would then be about \$33–45 million (or about \$45,000 per U.S. acre). Considering an offshore reclaimed island—again contained within a dike in an average water depth of -20 m, with an island width of say 5 km—then the cost per square km would be about \$120 million (or about \$150,000 per U.S. acre). Such offshore islands could be connected by solid causeways to the mainland forming 5-km-wide inland seas which would gradually fill up over a period of 30–50 years.

To double the area of the Gaza Strip, for example, would cost about \$75 billion. Such developments could also provide the area with access to deep water if coastal reclamation were employed. If the reclamation were planned in the southern part of the Gaza Strip, costs could be reduced to about half because of the shallower water depths.

The proposed artificial island or coastal reclamation schemes are designed to sustain the highest Mediterranean waves using large-scale protection. Prefabricated concreted caisson artificial island or dike construction may provide a more economic construction approach and should be investigated.